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CTF-TEST-R166P.0133

Exemption 6

R718109

NOV 15 '85

CENTRAL TECH FILE

Railroad Humping Shock Tests
of the
W31 Y1-3 Warhead on the H541B Handling Truck

31- Prog
X H-541B

Environmental Test Report

Exemption 6

7541

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Exemption 6

Approved by

Test Engineer 7541

Exemption 6

5113

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3140 Central Technical File

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Department of Energy review required before public release.

Name/Org.: K. K. Forman/ DOE SNL Date: 21 June 2017

Guidance (if applicable)

38p.

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R718109

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Introduction

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The objective of this test request was to establish the capability of the W31 Warhead Electrical Assembly to function after exposure to an ambient 11 mph railroad humping shock environment. This warhead has a security classification of CRD but is visually unclassified.

This test was requested by Exemption 6, Organization 5113, SNLA on May 28, 1985. The test unit assembly arrived at the SNLA test ramp facility, Bldg. 6710, on June 13, 1985. Testing was completed on June 20, 1985.

Exemption 6

A copy of the Test Planning Request is provided in Appendix A of this report.

Procedure and Results

The W31 Y1-3 test unit was instrumented with one Endevco 2228C piezoelectric triaxial accelerometer. An Endevco 2262-200 piezo-resistive accelerometer was mounted on the floor of the ramp cart to measure the input shock pulse.

This test unit assembly was attached to the ramp cart floor using multiple tie down chains. This mounting aligned the W31 Y1-3 Warhead's longitudinal axis parallel with the ramp cart track rails. This test setup is shown in Figure 1.

Acceleration time histories and shock spectra were requested from the previously described test accelerometers. The resulting test data plots are located in Appendix B.

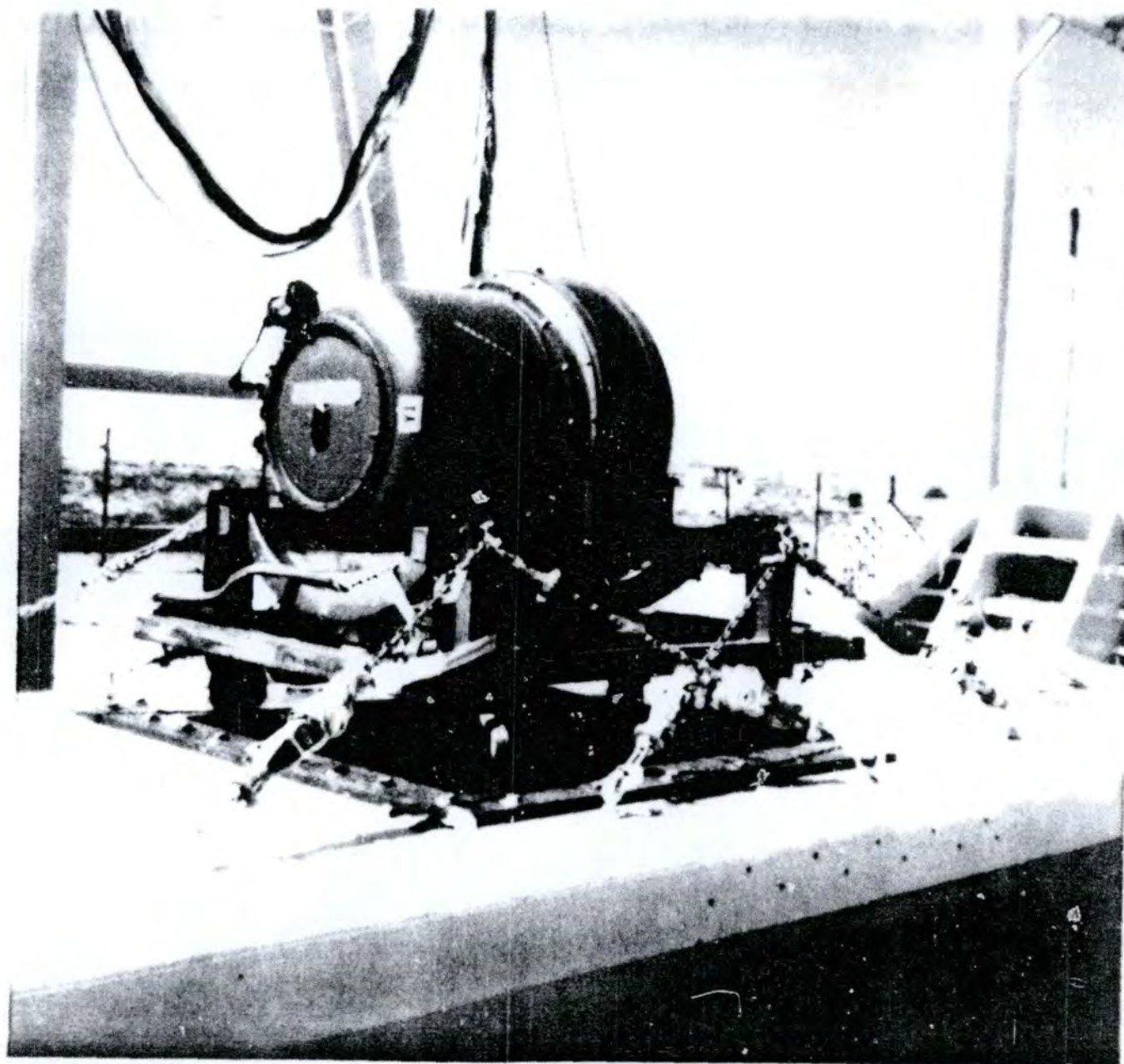
The test data recorded was lowpass filtered at 2480 Hz. A Rockland multi-channel analog, lowpass Bessel filter was used. This particular type of filter is a linear phase filter. The Cutoff Frequency of this Bessel filter is defined to be the frequency at which the phase shift is equal to 360 degrees. All test plots indicate a filter frequency in the upper right-hand corner of each plot. This filter frequency (Hertz) label on each plot represents the frequency at which the Bessel filter amplitude response is down 3 db. This -3 db point is located at half the filter's Cutoff Frequency.

The railroad humping shock pulse generated was a 17.5 G's peak amplitude, 42 msec. duration (measured over 10% of the peak amplitude interval), symmetrical Haversine pulse. This transient input resulted in the failure of three of the four test assembly shear pad mounts. These failures appeared to be due to the old age of the rubber shear pads. These shear pads were replaced and the test was repeated. All four of these pads sheared off in the second and final hump test. Figures 2 and 3 illustrate these shear pad failures.

The W31 Warhead Electrical Assembly remained functional after both hump shock tests. The rubber shear pads were not pertinent to meeting the specific test objective. Therefore, the W31 Warhead Electric Assembly was qualified under an ambient, 11 mph railroad shock environment.

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Figure 1: W31 Railroad Bumping Shock Test Setup on Ramp Cart

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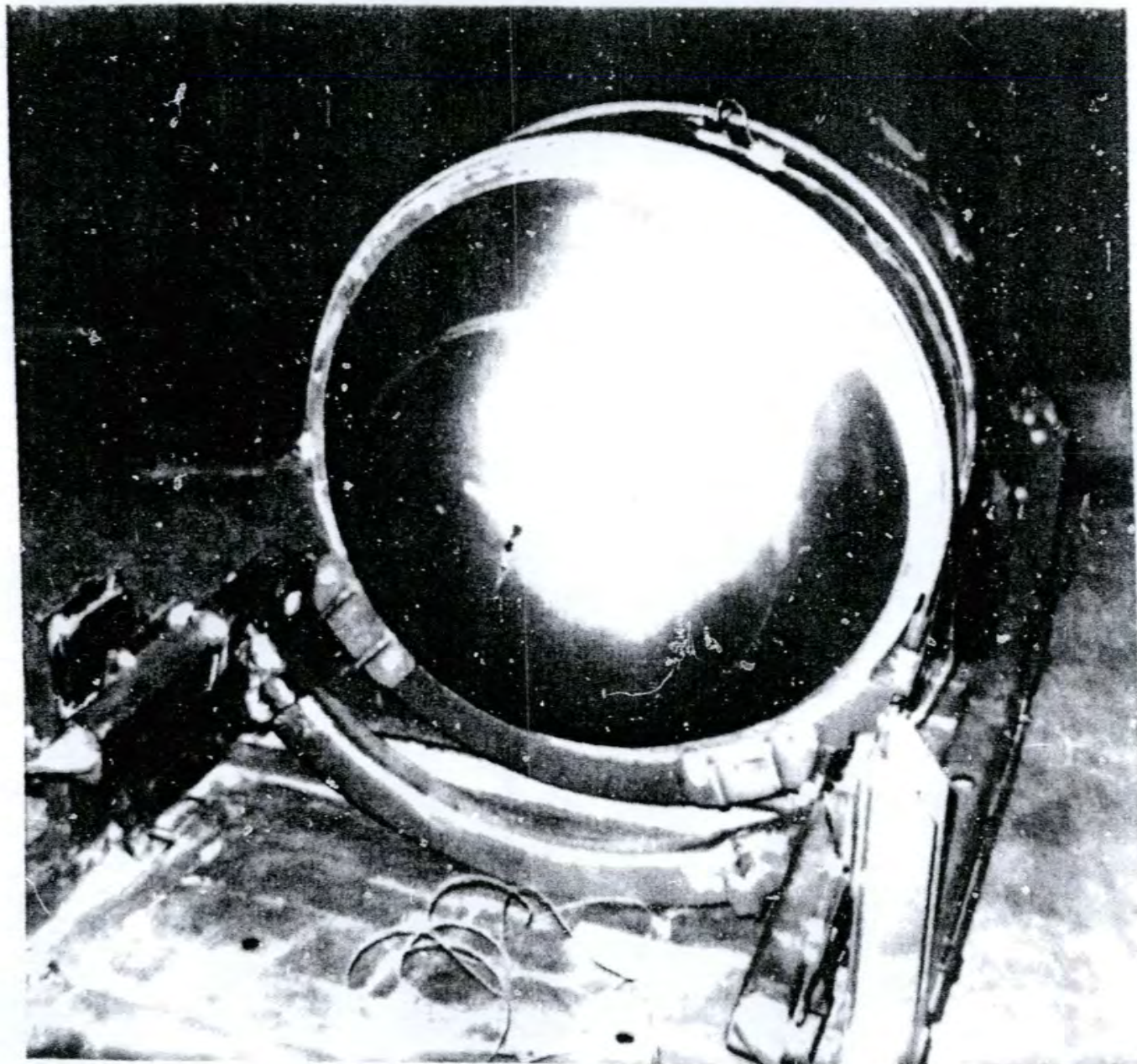
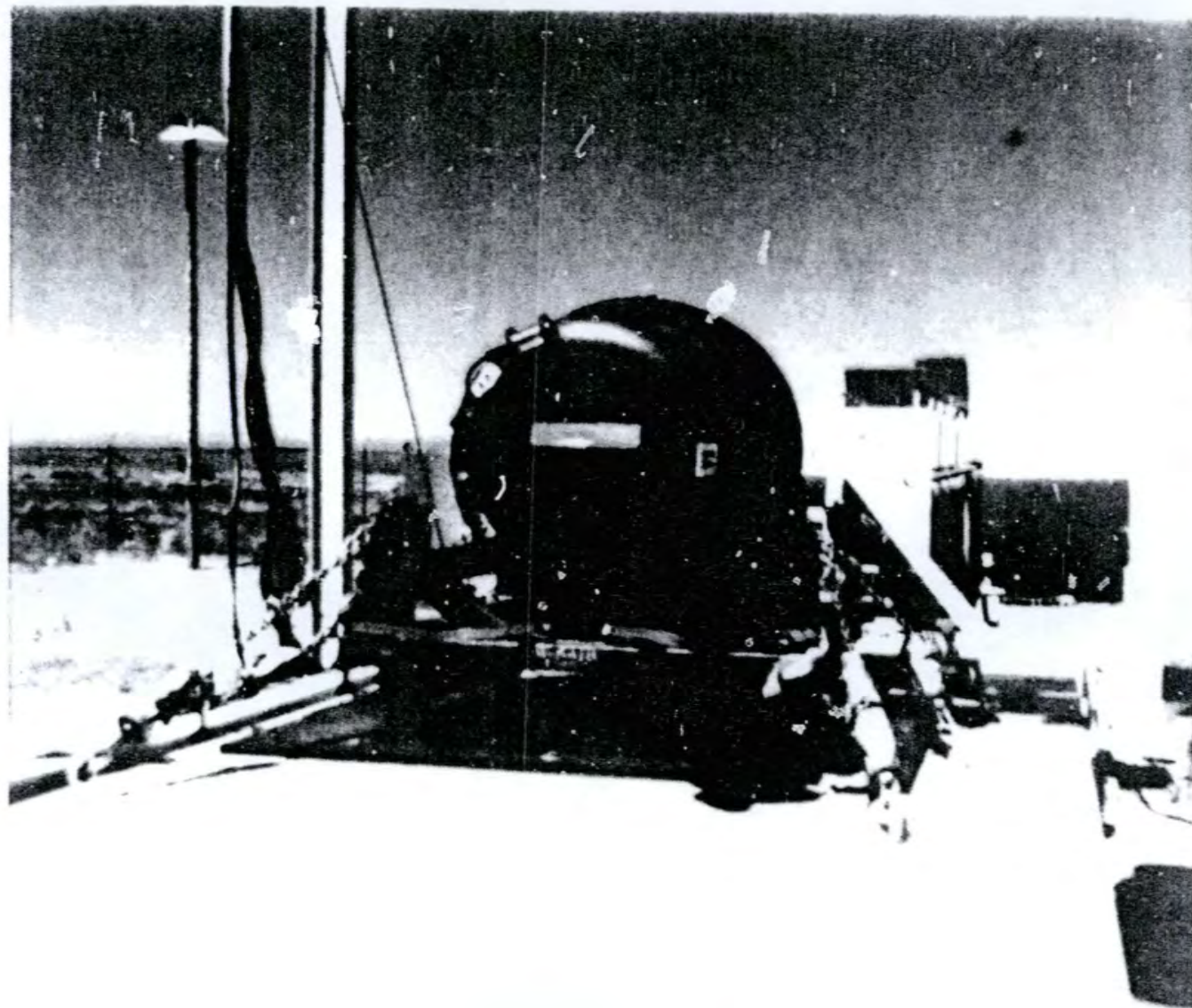


Figure 2: Typical Rubber Shear Pad Failures

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Figure 2. Near Assembly Configuration after Railroad Impact.
Note, 2A Shear Pad Failures.

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Appendix A
Test Planning Request

TEST PLANNING REQUEST

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Test Project Leader/Engineer Engineer/TC Exemption 6	Org 7541	Phone Exemption 6	Date May 28, '85	Test Number R-718109
Org. 5113		Bldg. B36	Phone Exemption 6	Case Number 1382010
Test Item W31Y1-3 Warhead on H541B Handling Truck	Dwg. No. CD301708	Approximate Dimensions W31 = 900 H541 = 500 Total: 41" W x 59" L x 48" H (Warhead max dia = 29") Total: 1460 lbs weight SUS		Total Quantity See Test System
Security Classifications Highest = CRD	Name UNC	Test Item CRD	Association UNC	Visual UNC
Data/Report UNC		Form UNC		

☐ CNWDI Material* ☐ Category I SS Material* (Security Procedures Required When Marked)

*Security escort and/or protection of material required if either item checked.

Hazards ☒ None ☐ Yes (Hazards Information Form Required When Marked)

Type ☐ Explosives Self Contained ☐ SS Material ☐ Toxic Material

☐ Explosives Other ☐ Pressure Devices ☐ Other Hazards

Title of Test W31 Railroad Humping Shock at Room Temp.

Purpose: To determine the capability of the W31 Warhead Electrical Assembly to function satisfactorily after exposure to the railroad humping environment.

Description: See the Attachment for test specs, axes definition, instrumentation, data acquisition requirements, etc.

Data available (will go to vib or hump - depending upon first availability)

Test Start Date 5/29/85 Test Period _____ Estimated Test Duration _____
 Report Desired ☒ Complete Report ☐ Data Report ☐ Memo ☐ No Report
 Cost Estimate Desired ☒ No ☐ Yes (Environmental Test Estimate Form Required When Marked)
 Test Fixture Available ☐ No ☐ Yes ☐ New Fixture (No required)

Test Support Activities

General Test	Resp. Org.
<input checked="" type="checkbox"/> Test Plan/Specifications	5113
<input checked="" type="checkbox"/> Instrumentation List	5113
<input type="checkbox"/> Test Control Drawing	
<input checked="" type="checkbox"/> Safe Operating Procedures	7541
<input checked="" type="checkbox"/> Test Report Distribution	5113

Test Support	Org.
<input checked="" type="checkbox"/> Still Photography	7541
<input type="checkbox"/> Photometrics (Data)*	
<input type="checkbox"/> Photometrics (Documentary)	
<input type="checkbox"/> TM Design	

General Test	Resp. Org.
<input type="checkbox"/> Vibration Test Spec.*	
<input checked="" type="checkbox"/> Shock Test Spec.*	5113
<input type="checkbox"/> Acceleration Test Spec.*	
<input type="checkbox"/> Climatic Test Spec.*	
<input type="checkbox"/> Static Test Spec.	

Test Support	Org.
<input type="checkbox"/> TM Recording	
<input type="checkbox"/> Instrumentation Design	
<input type="checkbox"/> Facility Design*	
<input type="checkbox"/> Flash X-Ray	

*Supplemental Form Required when marked

Test Location ☐ AI ☒ AIII ☐ Coyote ☐ Other _____

Test Facility	Bldg.
<input type="checkbox"/> Centrifuge	
<input type="checkbox"/> Climatic	
<input type="checkbox"/> Radiant Heat	
<input type="checkbox"/> Vibration	
<input type="checkbox"/> Static Lab	
<input type="checkbox"/> Pressure Lab	

Test Facility	Bldg.
<input type="checkbox"/> Shock Lab	
<input type="checkbox"/> 18-in. Actuator	
<input checked="" type="checkbox"/> Ramp and Drop	6713
<input type="checkbox"/> Sled Track	
<input type="checkbox"/> Rocket Launcher	
<input type="checkbox"/> Ballistics Lab	

Test Facility	Bldg.
<input type="checkbox"/> Aerial Cable	
<input type="checkbox"/> Shock Tube	
<input type="checkbox"/> Explos. Firing Site	
<input type="checkbox"/> Drop Tower	
<input type="checkbox"/> Radiograph/NDT	
<input type="checkbox"/> Other	

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ATTACHMENT
Page 1 of 3
(RT18109)W31 Transp'n. shock - RR Humping

SPECS

Transportation Shock - W31 and Components - RR Humping

<u>Axis</u>	<u>Environmental Source</u>	<u>Number of Shock/Axis</u>	<u>Reference Figures</u>	<u>Reference Table</u>
Vertical and Longitudinal	Rail - 11 mph Humping	2	1 & 2	i

TABLE 1 - RAIL - 11 MPH HUMMING SHOCK (3)
LONGITUDINAL AND VERTICAL CAR AXIS

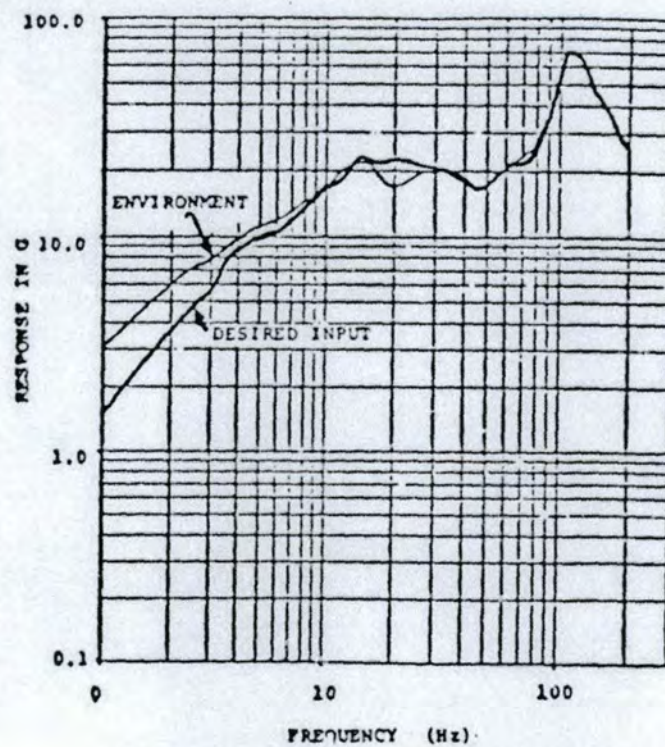
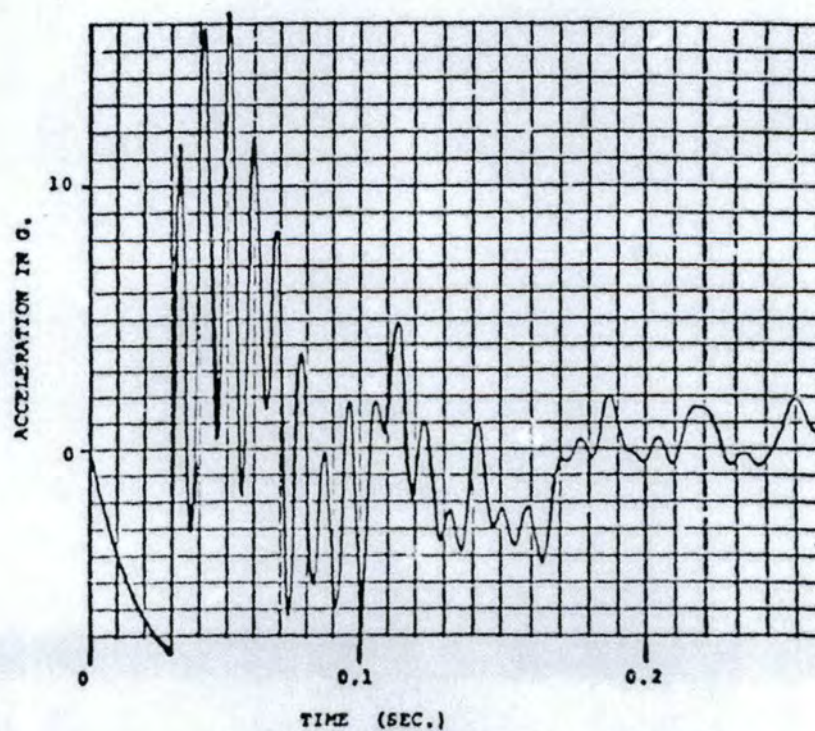
<u>Pulse No.</u>	<u>A₀(g)</u>	<u>A(g)</u>		<u>f(Hz)</u>	<u>Duration (sec.)</u>	<u>Delay Time (sec.)</u>
1	26.68	11.16	0.7	5.3	0.288	0.057417
2	10.74	8.0	0.2	14.0	0.288	0.057417
3	1.72	1.87	0.02	28.0	0.288	0.057417
4	2.43	2.25	0.05	38.0	0.288	0.057417
5	2.5	2.43	0.02	65.0	0.288	0.057417
6	11.53	11.00	0.03	110.0	0.288	0.057417
7	-23.81	-8.32	0.9	3.0	0.288	0.0

Peak Accel. = 16.4 g, -7.67 g

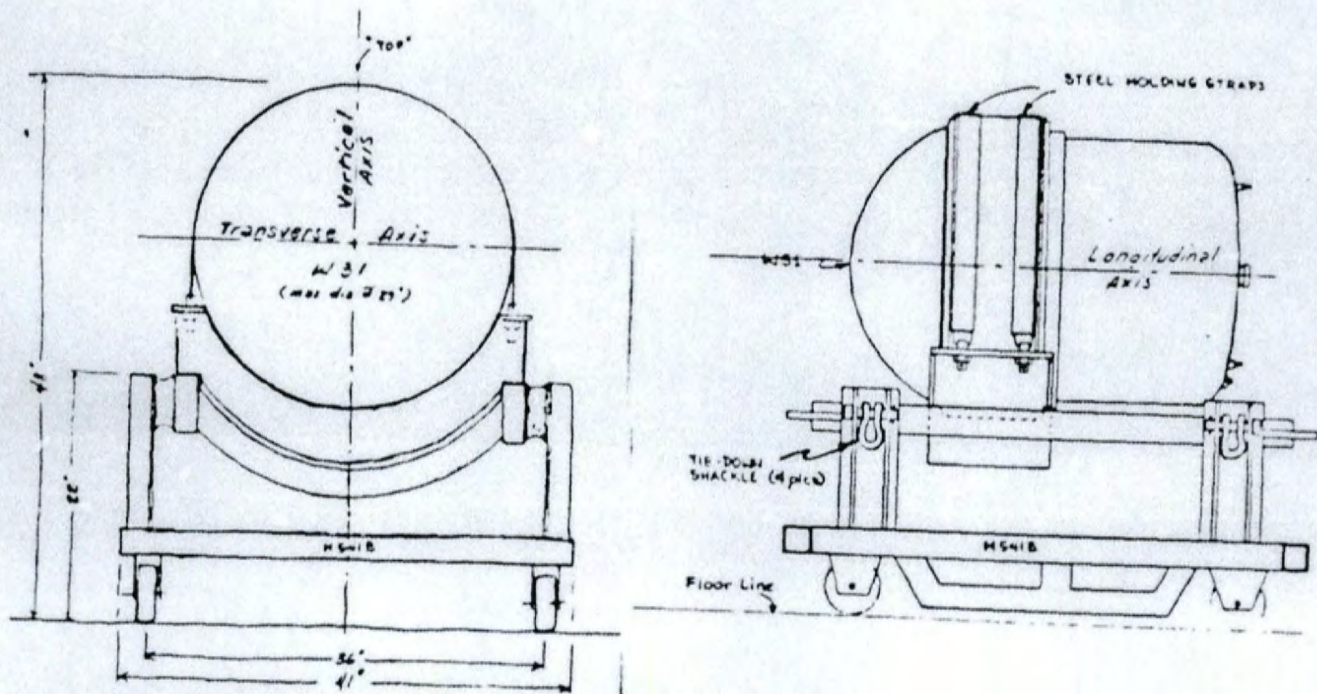
Max Vel. = 43.25 in/sec., -56.41 in/sec.

Max Displ. = 1.009 in, -1.303 in

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ATTACHMENT
Page 2 of 3
(E 718109)FIGURE 1 - RAIL SHOCK - 11 MPH HUMMING
LONGITUDINAL/VERTICAL SHOCK SPECTRAFIGURE 2 - RAIL SHOCK - 11 MPH HUMMING
LONGITUDINAL/VERTICAL TIME HISTORY

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ATTACHMENT
Page 3 of 3
(R718109)W31 DEFINITION OF AXES
(Not to Scale)

000144

Appendix B

Test Data Plots:

Test #1 - 13 Plots

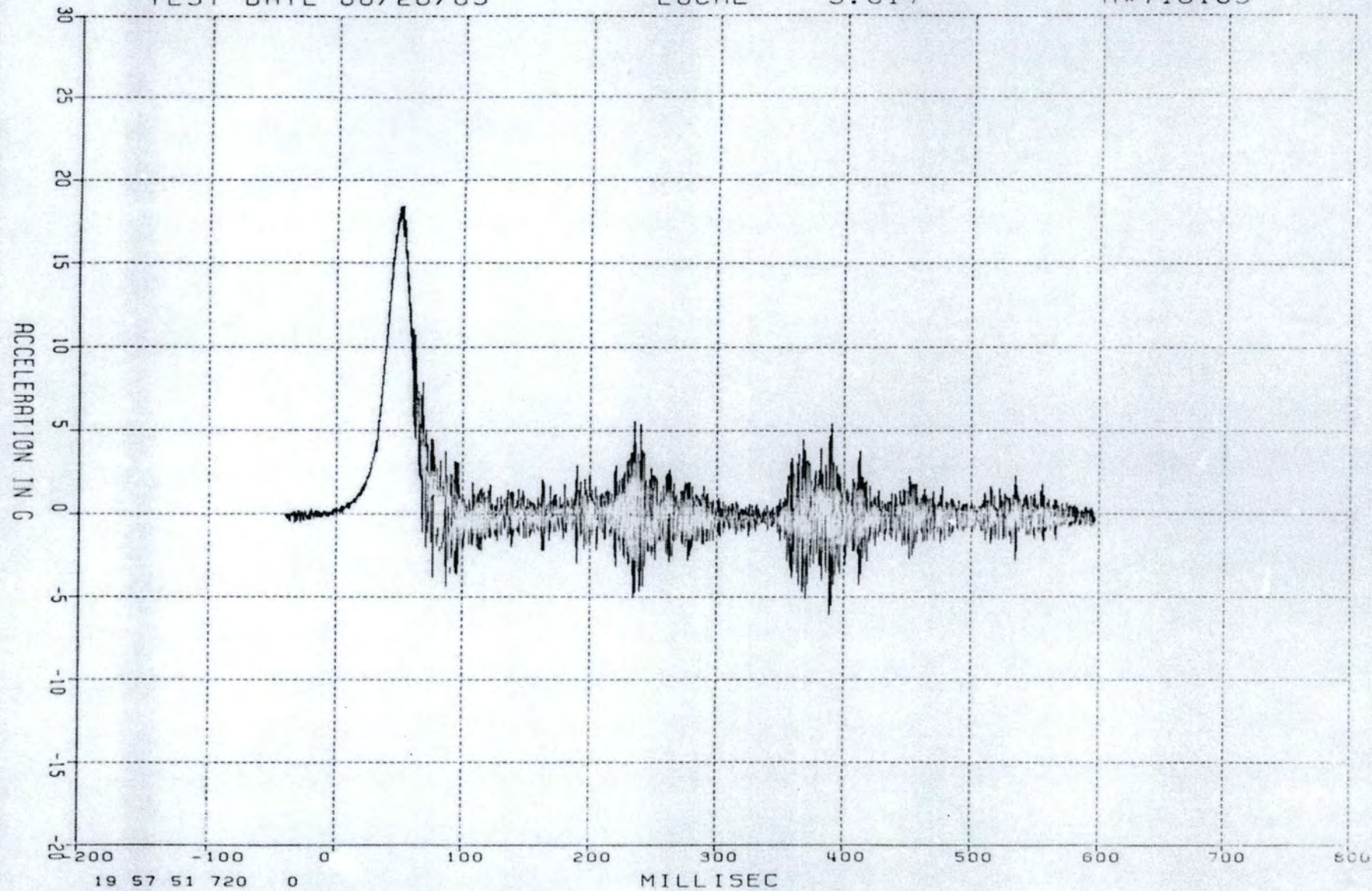
Test #2 - 13 Plots

77

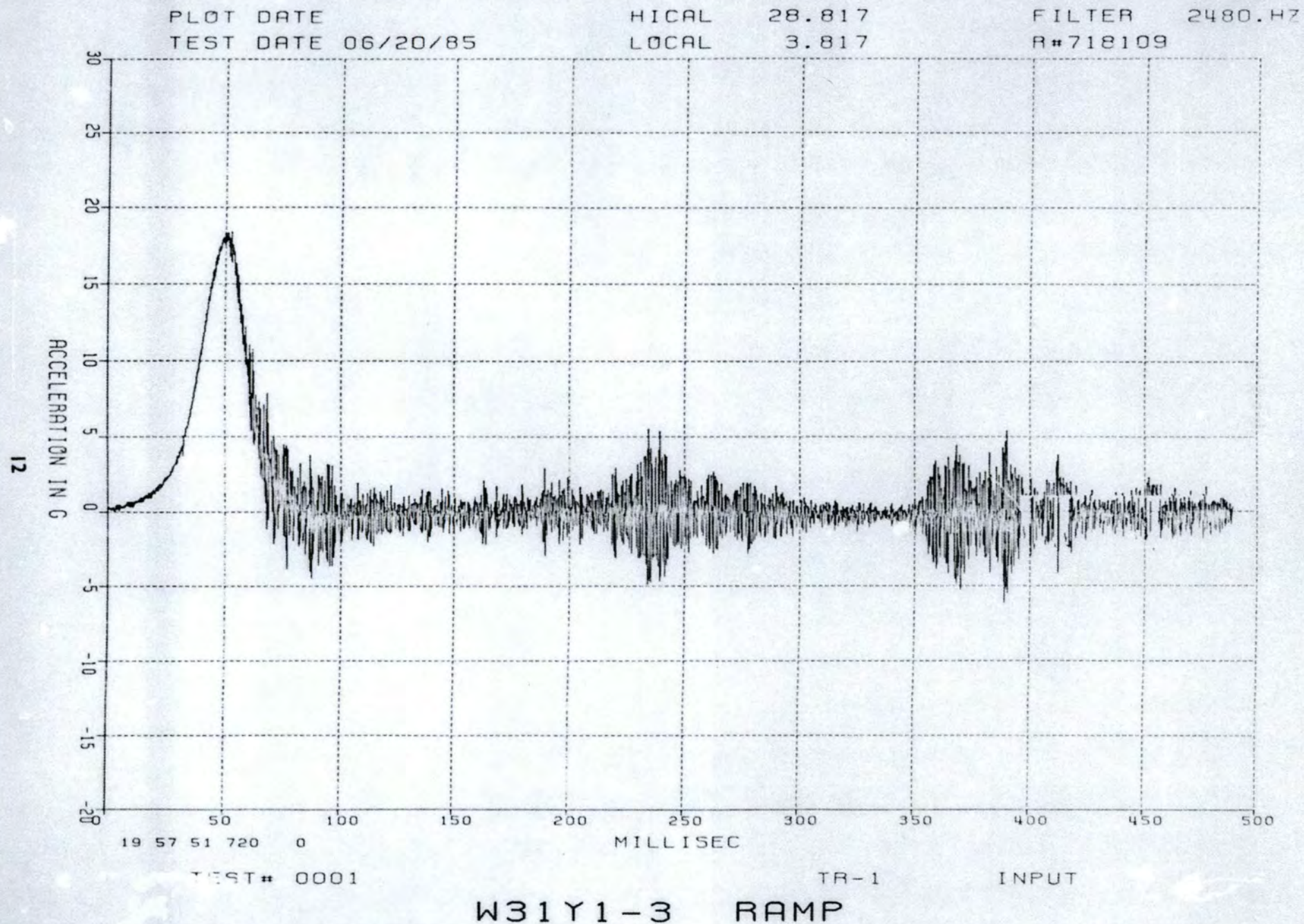
PLOT DATE
TEST DATE 06/20/85

HICAL 28.817
LOCAL 3.817

FILTER 2480.4Z
R#718109



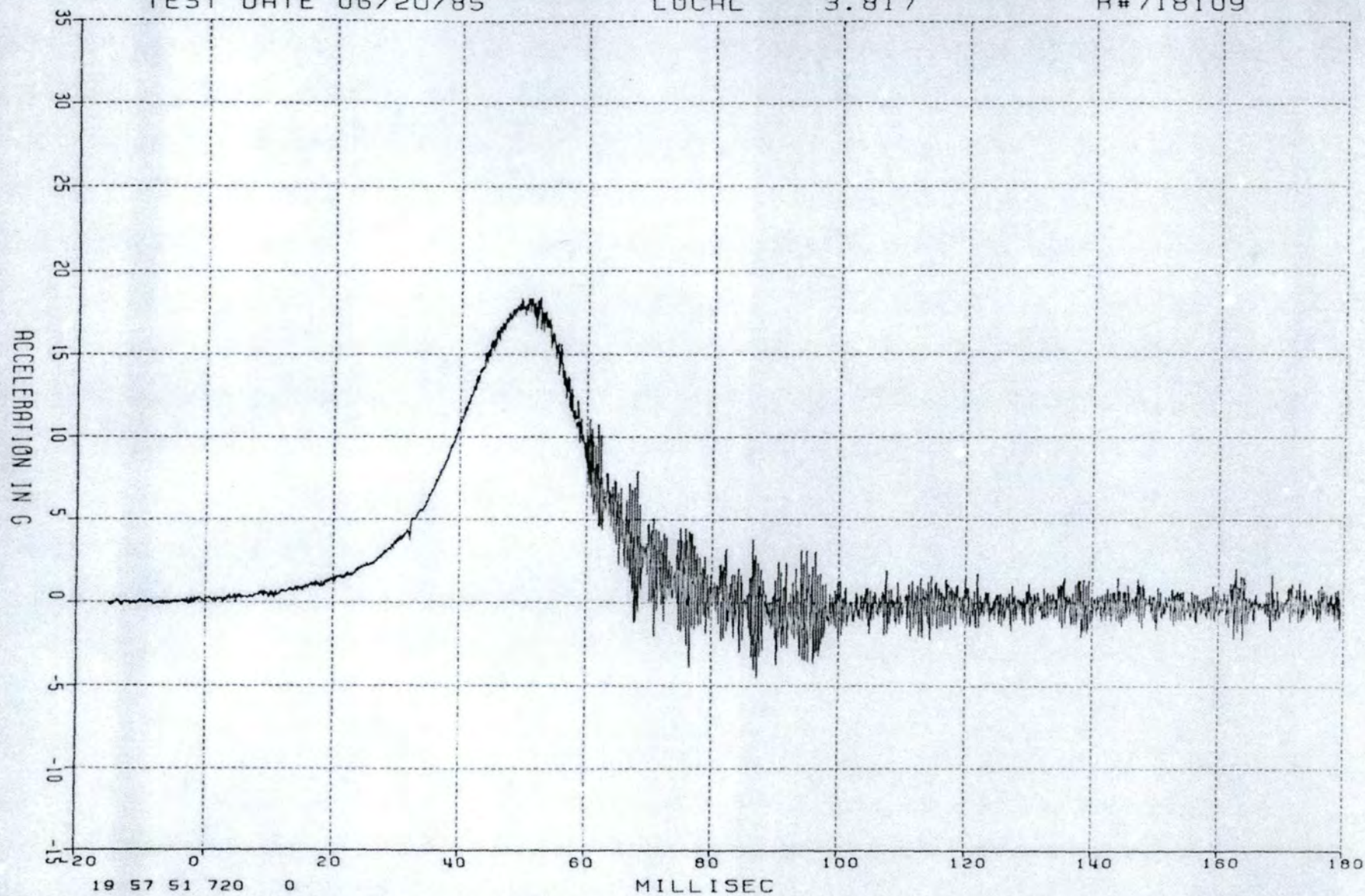
W31Y1-3 RAMP



PLOT DATE
TEST DATE 06/20/85

HICAL 28.817
LOCAL 3.817

FILTER 2480.HZ
R#718109



TEST# 0001

TR-1

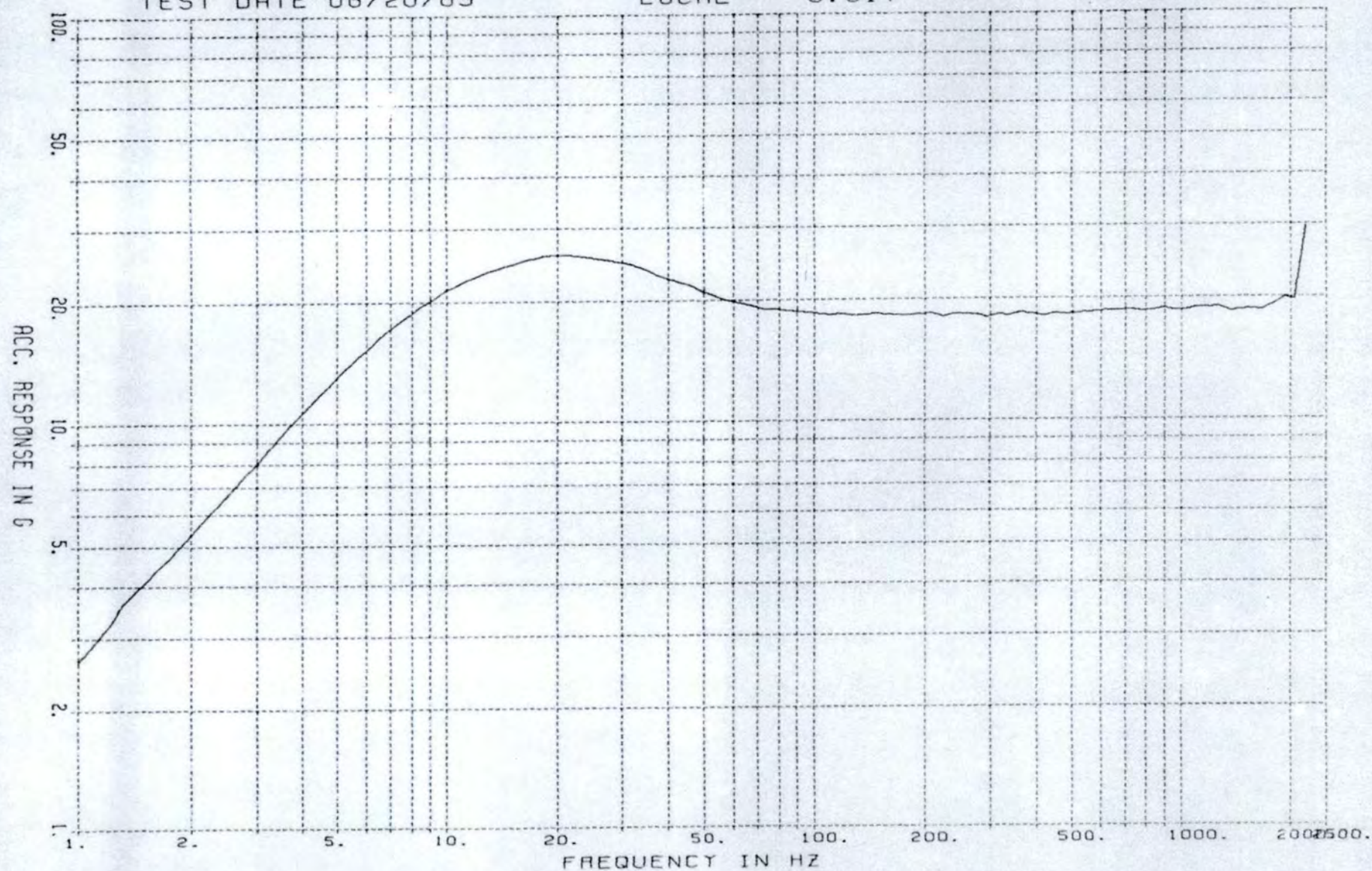
INPUT

W31Y1-3 RAMP

PLOT DATE
TEST DATE 06/20/85

HICAL 28.817
LOCAL 3.817

FILTER 2480.HZ
R#718109



TEST# 0001

SR= 4819.276

DR= .030

W31Y1-3 RAMP

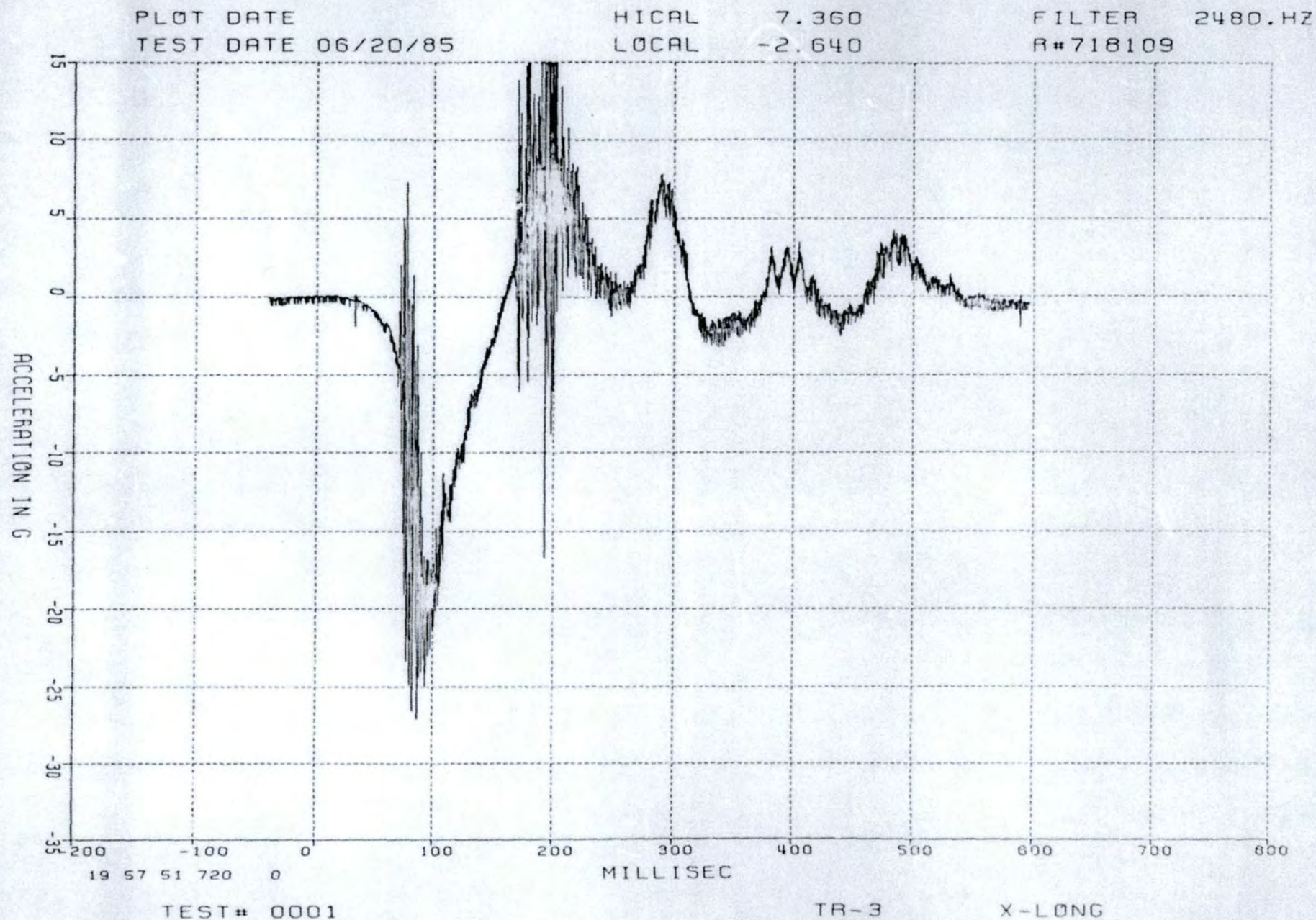
TR-1

INPUT

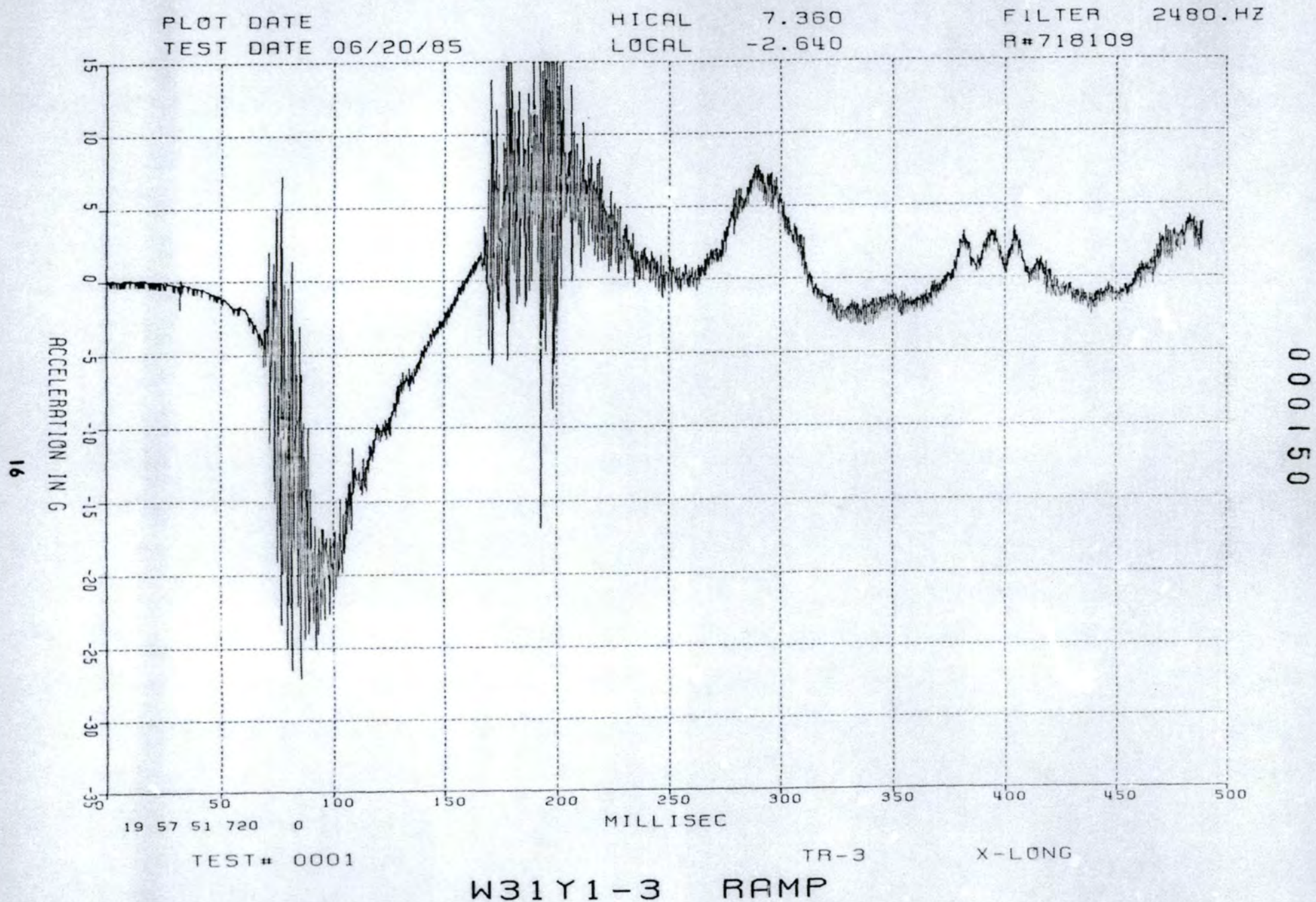
SHOCK SPECTRA

P/O= 10

000148



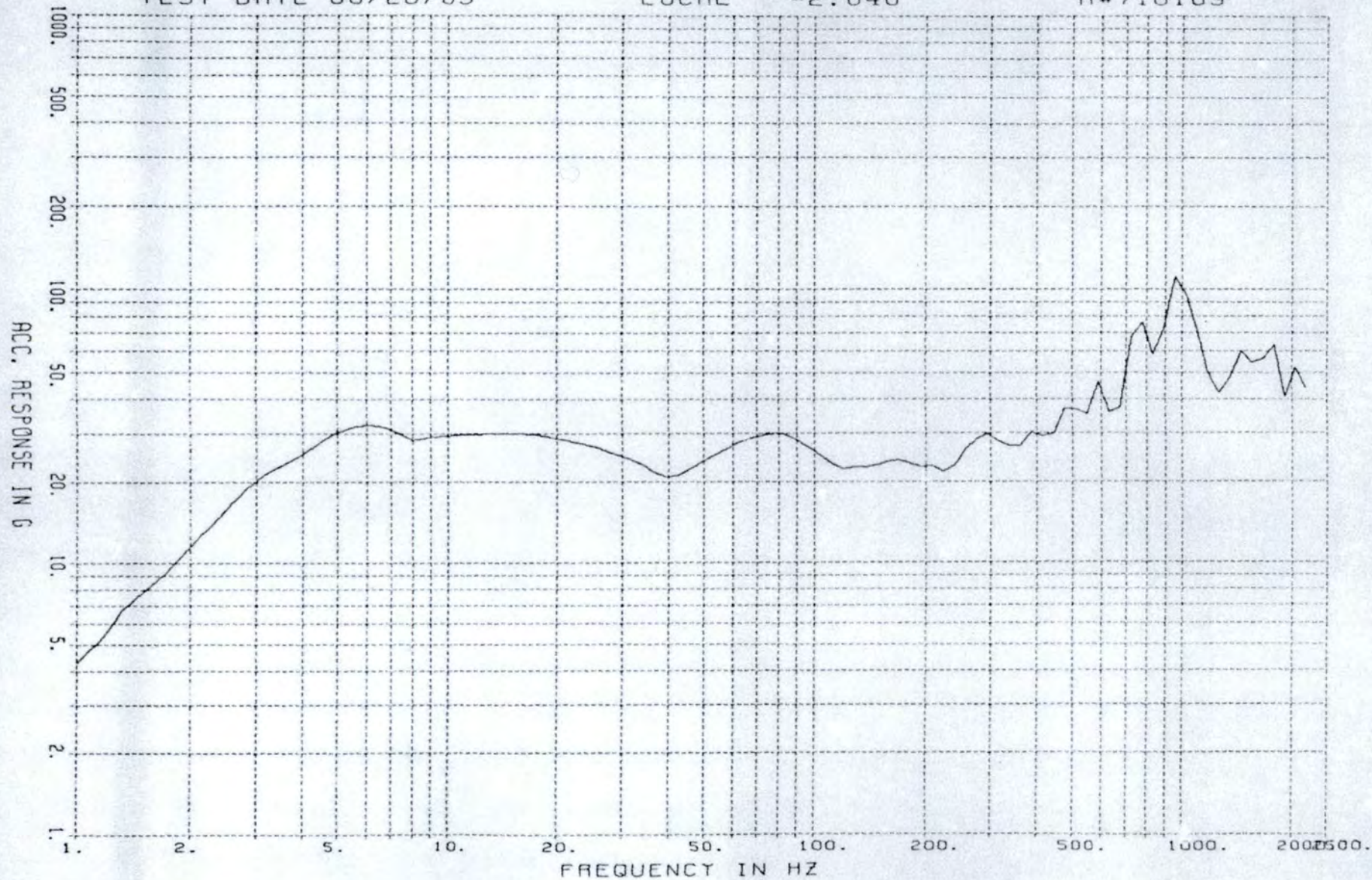
W31Y1-3 RAMP



PLOT DATE
TEST DATE 06/20/85

HICAL 7.360
LOCAL -2.640

FILTER 2480.HZ
R#718109



TEST# 0001

SR= 4819.276

DR= .030

W31Y1-3 RAMP

TR-3

X-LONG

SHOCK SPECTRA

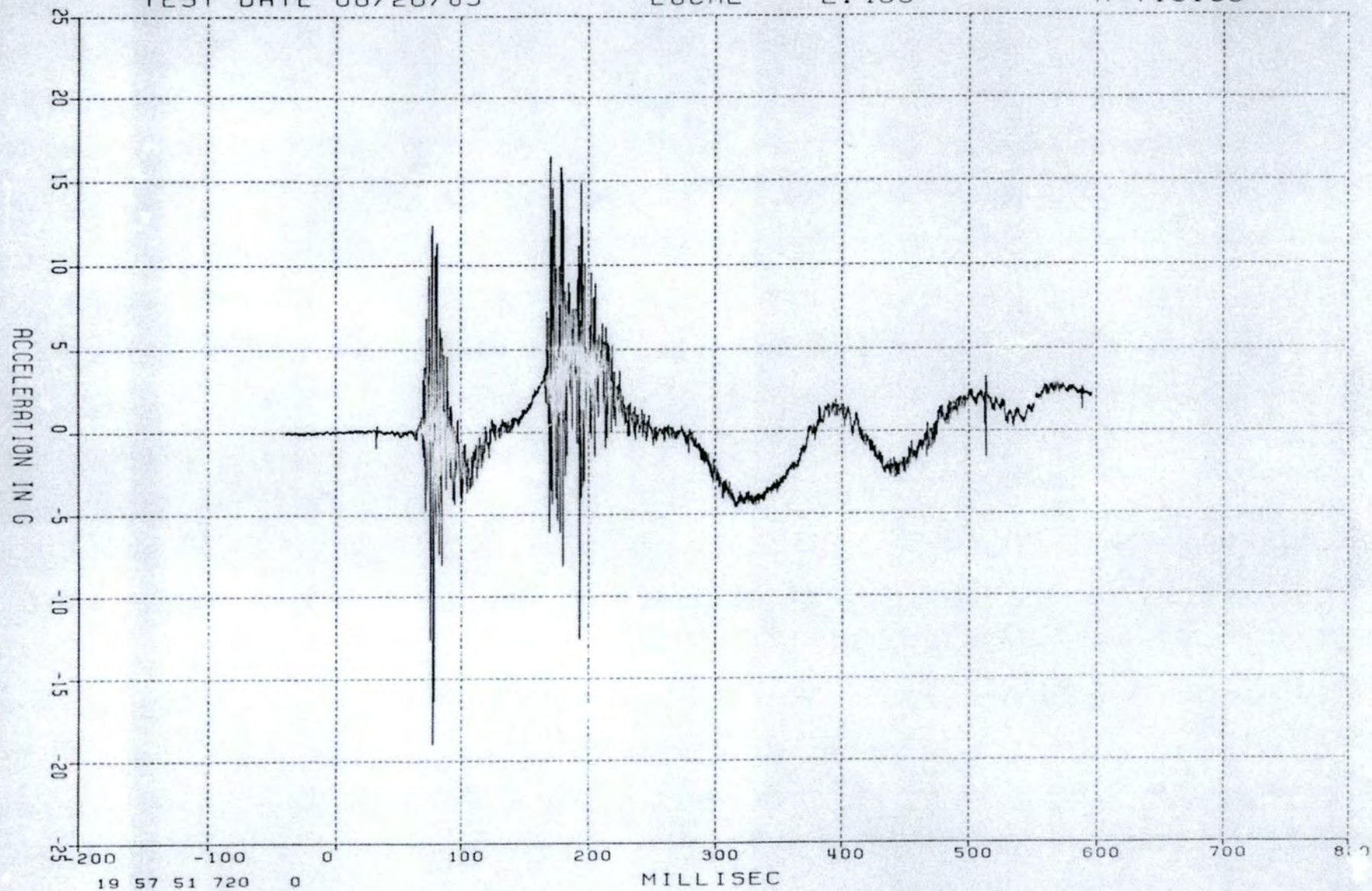
P/O= 10

000151

PLOT DATE
TEST DATE 06/20/85

HICAL 12.488
LOCAL 2.488

FILTER 2480.17
R#718109



TEST# 0001

TR-4

Y-LAT

W31Y1-3 RAMP

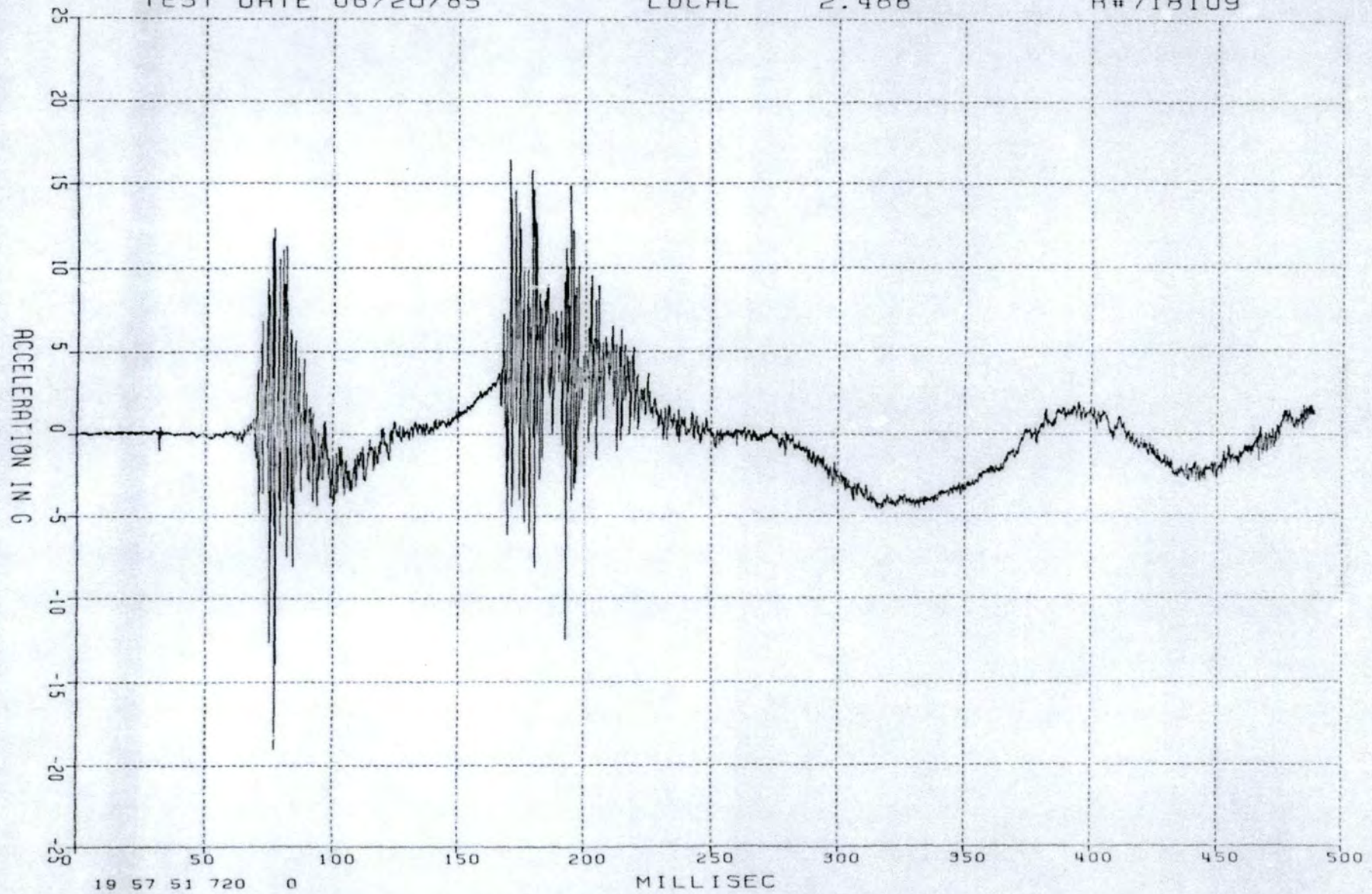
000152

PLOT DATE
TEST DATE 06/20/85

HICAL 12.488
LOCAL 2.488

FILTER 2480.HZ
R#718109

19



TEST# 0001

TR-4

Y-LAT

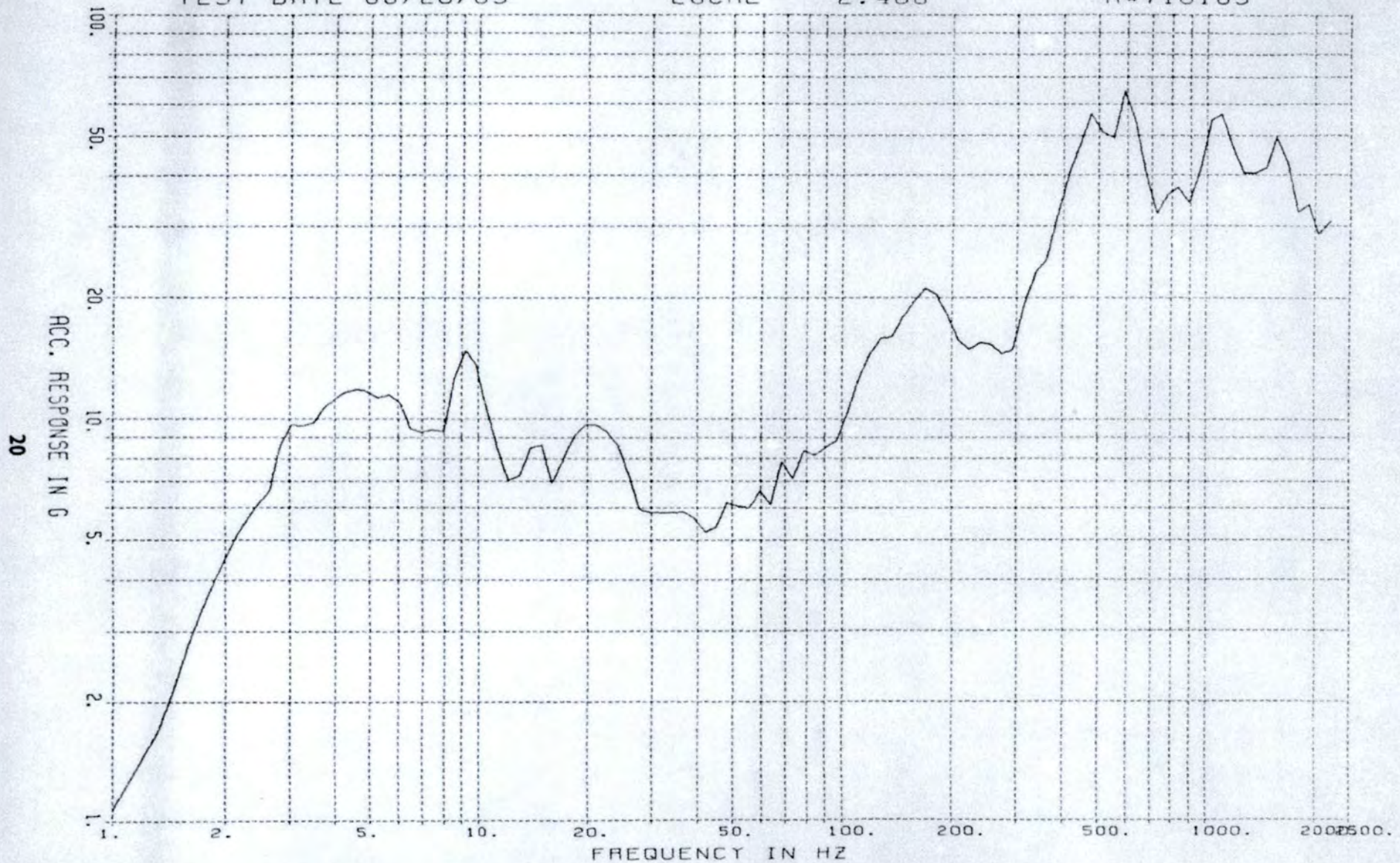
W31Y1-3 RAMP

000153

PLOT DATE
TEST DATE 06/20/85

HICAL 12.488
LOCAL 2.488

FILTER 2480.HZ
R#718109



000154

TEST# 0001

TR-4

Y-LAT

SR= 4819.276

W31Y1-3 RAMP

SHOCK SPECTRA

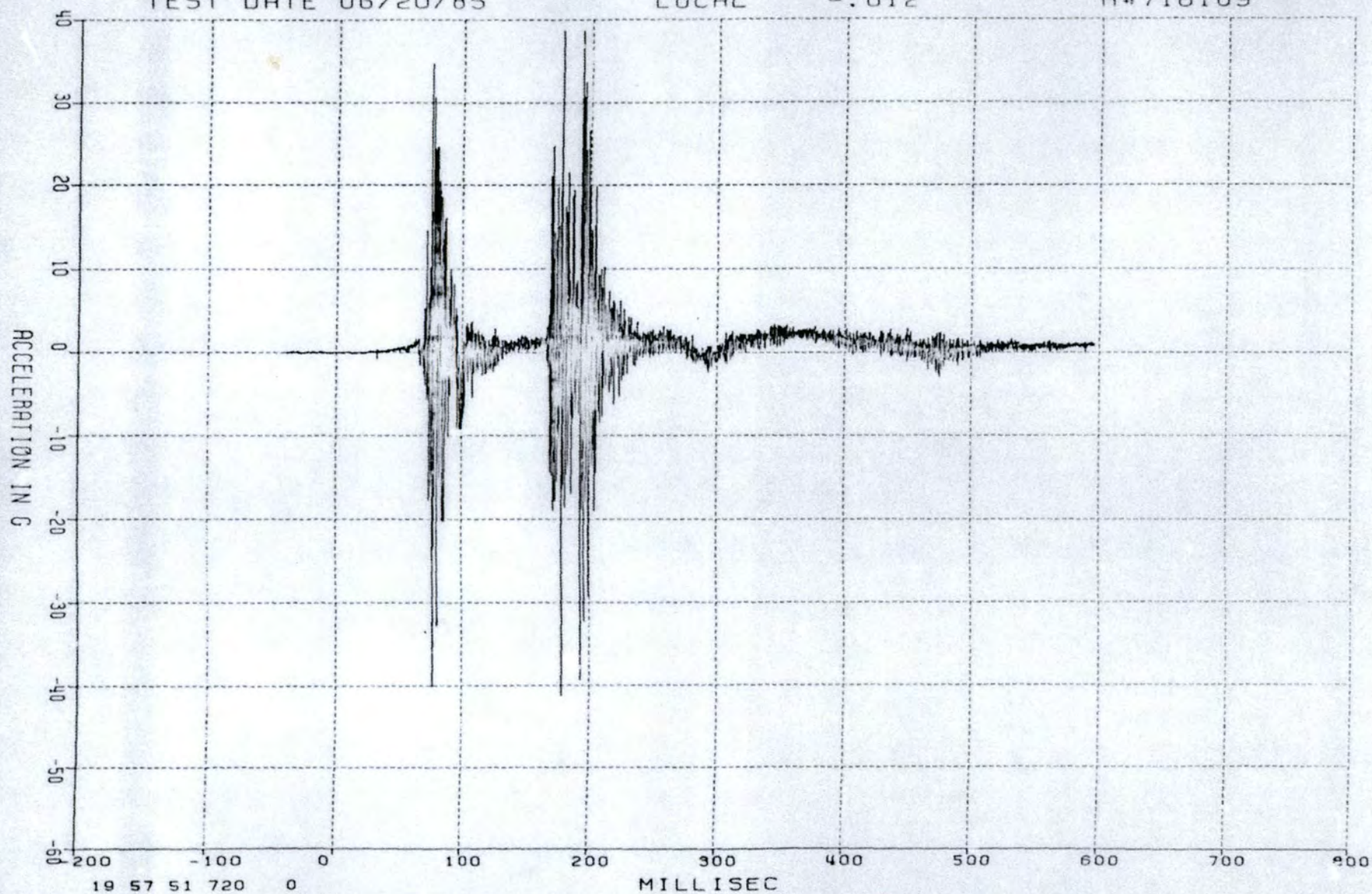
DR= .030

P/O= 10

PLOT DATE
TEST DATE 06/20/85

HICAL 9.988
LOCAL -.012

FILTER 2480.HZ
R#718109



TEST# 0001

TR-5

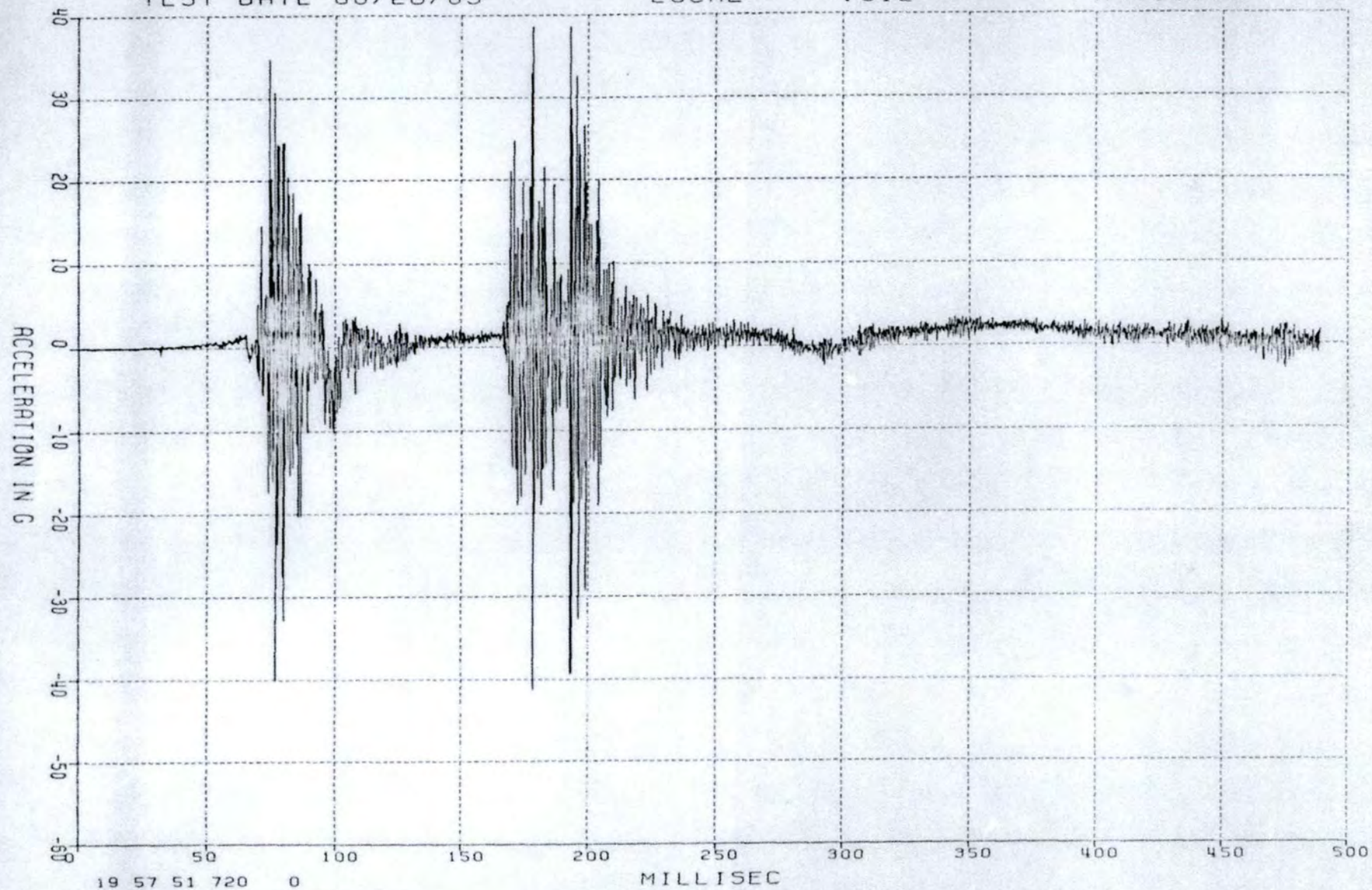
Z-VERT

W31Y1-3 RAMP

PLOT DATE
TEST DATE 06/20/85

HICAL 9.988
LOCAL -.012

FILTER 2480.HZ
R#718109



TEST# 0001

TR-5

Z-VERT

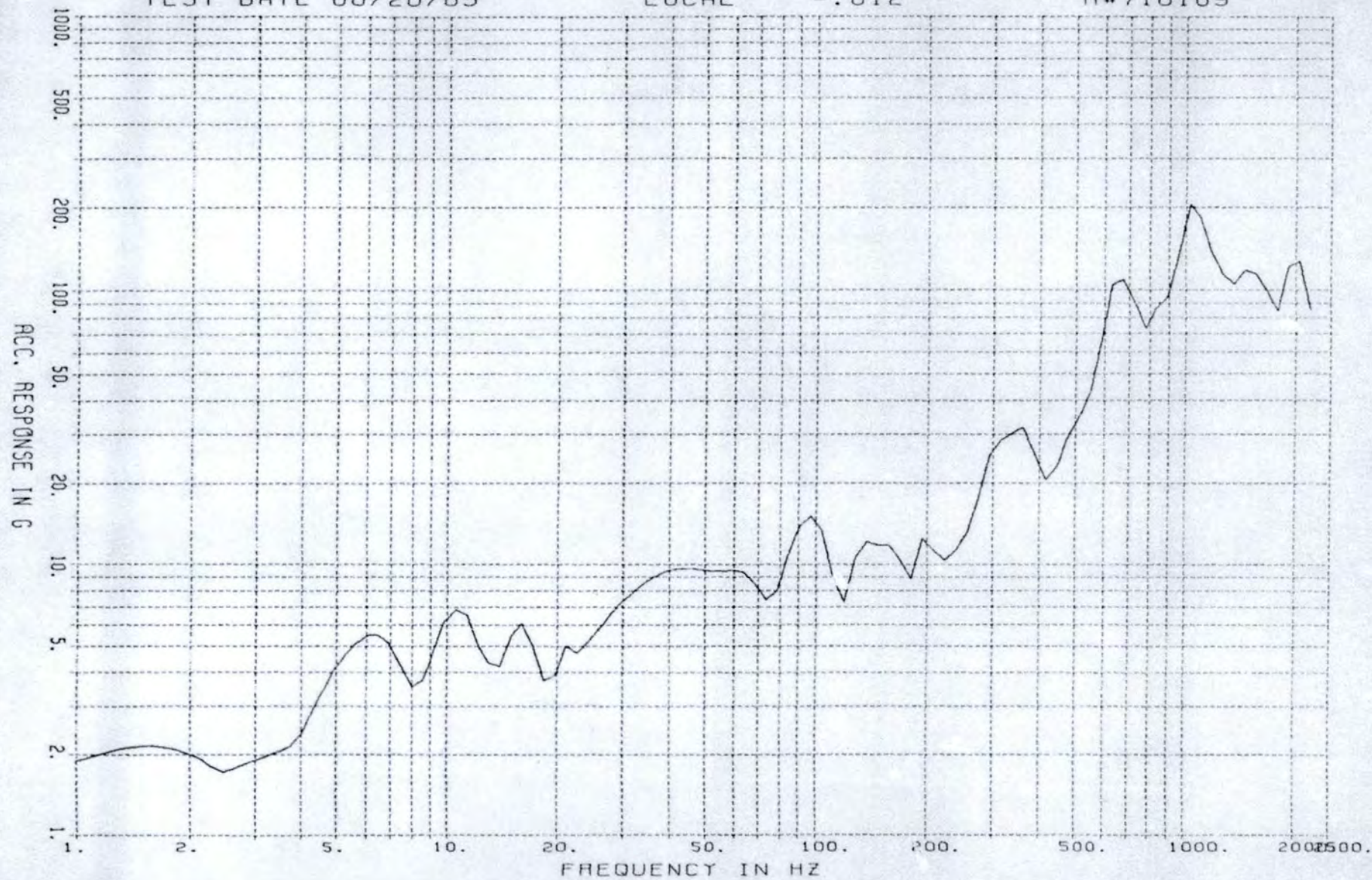
W31Y1-3 RAMP

000156

PLOT DATE
TEST DATE 06/20/85

HICAL 9.988
LOCAL -.012

FILTER 2480.HZ
R#718109



TEST# 0001

TR-5

Z-VERT

SR= 4819.276

W31Y1-3 RAMP

SHOCK SPECTRA

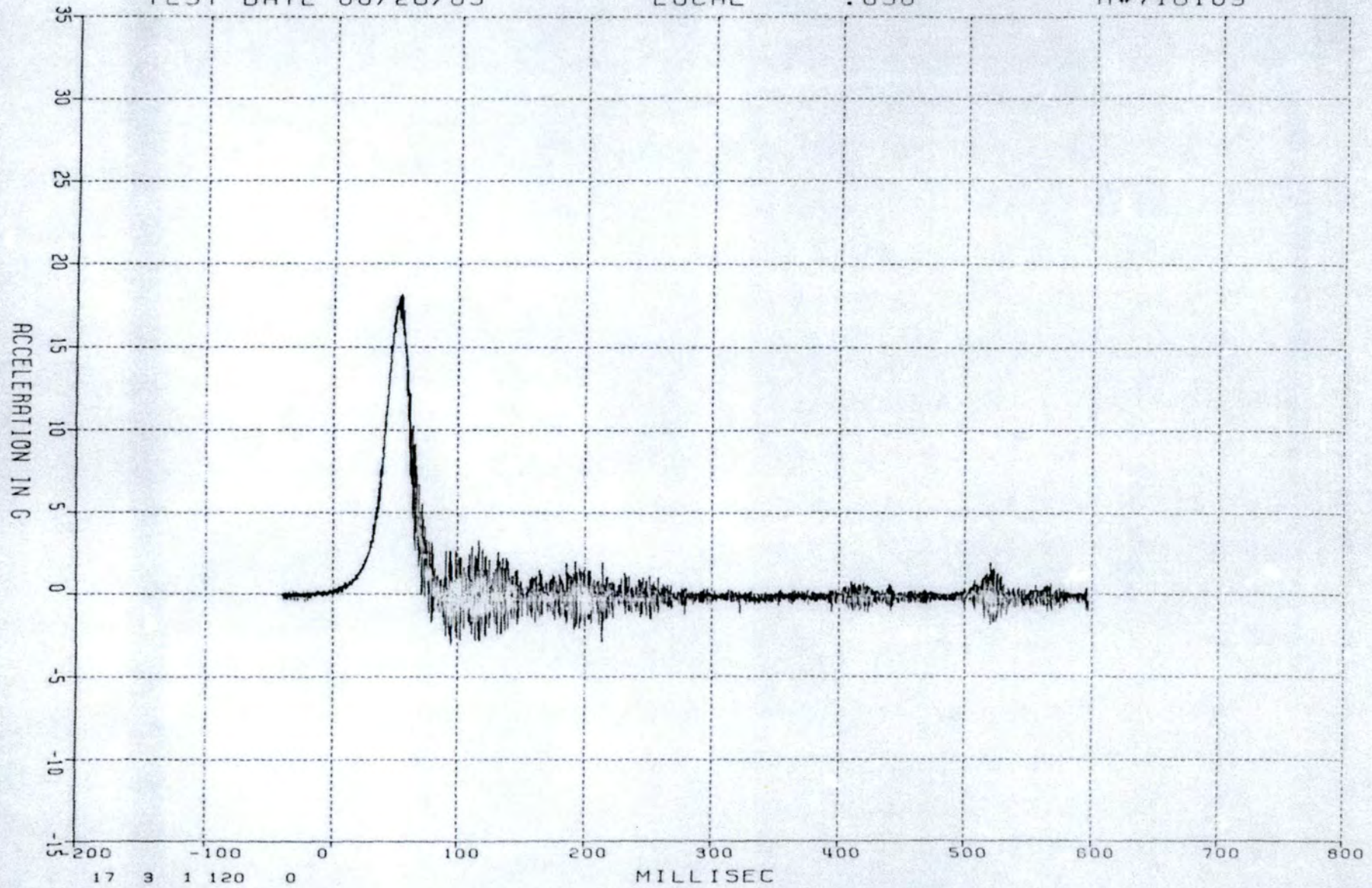
DR= .030

P/O= 10

PLOT DATE
TEST DATE 06/20/85

HICAL 25.038
LOCAL .038

FILTER 2480.HZ
R#718109



24

000158

TEST# 0002

TR-1

INPUT

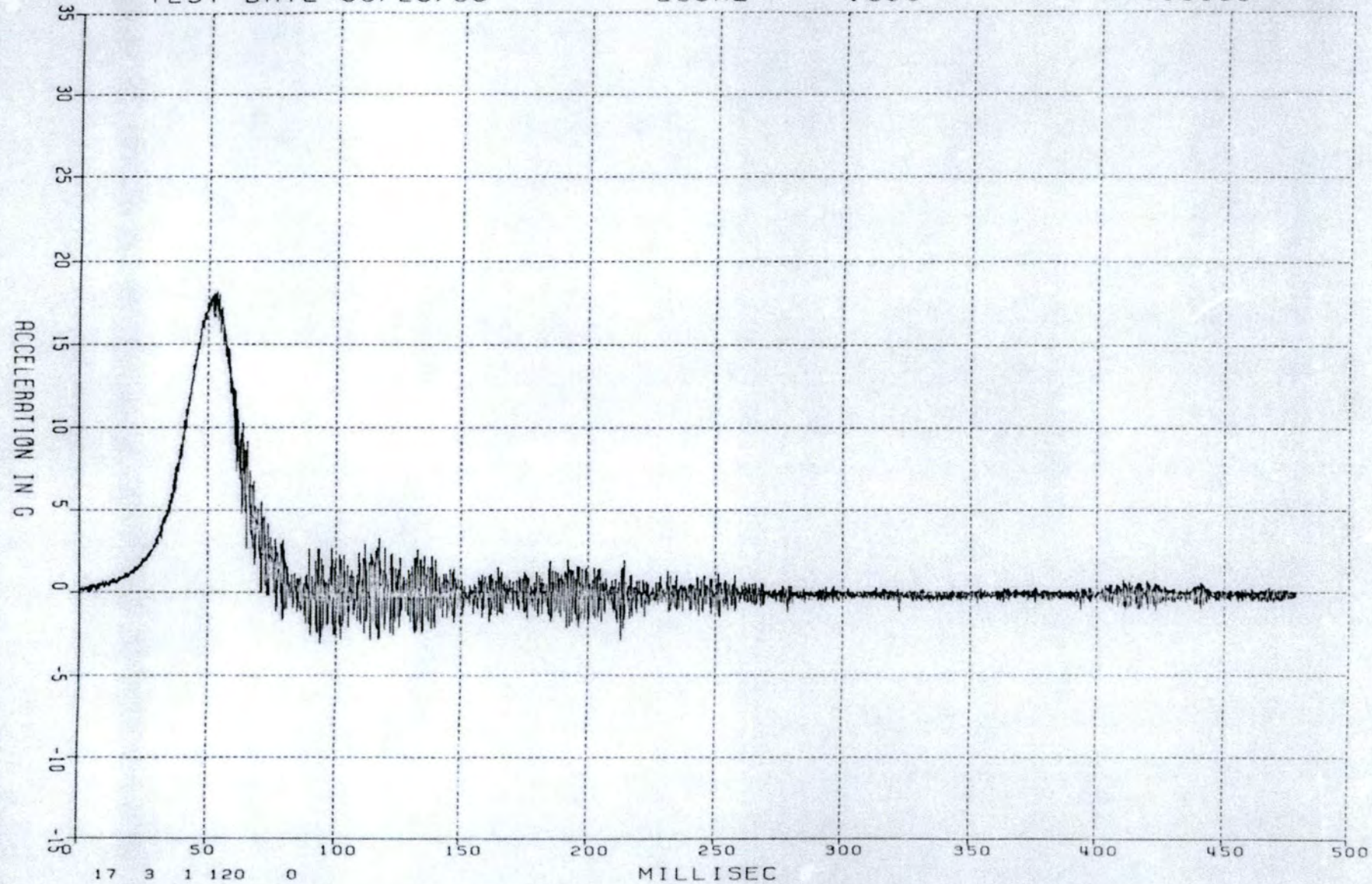
W31Y1-3 RAMP

PLOT DATE
TEST DATE 06/20/85

HICAL 25.038
LOCAL .038

FILTER 2480.HZ
R#718109

25



TEST# 0002

TR-1

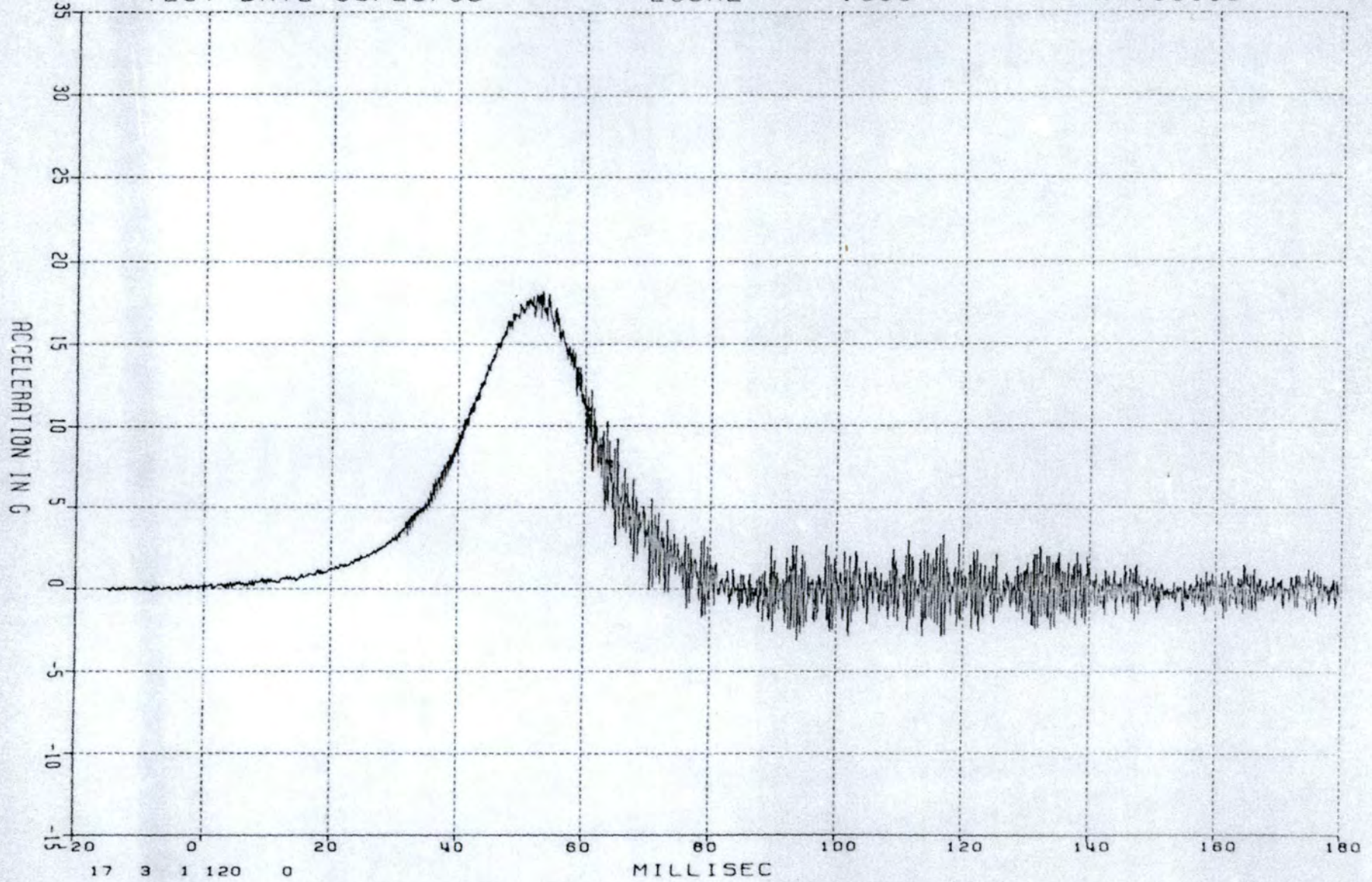
INPUT

W31Y1-3 RAMP

PLOT DATE
TEST DATE 06/20/85

HICAL 25.038
LOCAL .038

FILTER 2480.HZ
R#718109



26

000160

TEST# 0002

TR-1

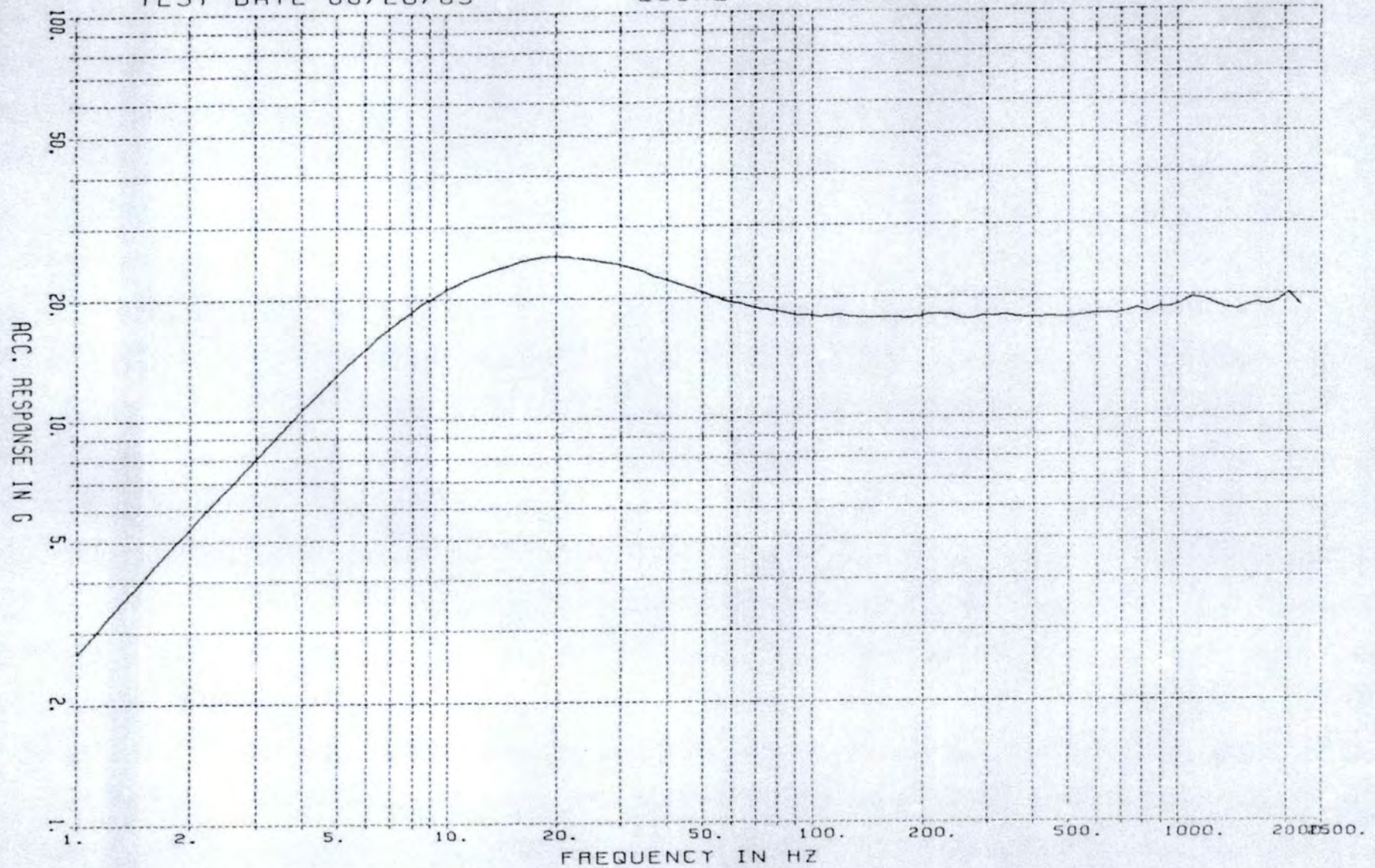
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W31Y1-3 RAMP

PLOT DATE
TEST DATE 06/20/85

HICAL 25.038
LOCAL .038

FILTER 2480.HZ
R#718109



TEST# 0002

SR= 4819.276

DR= .030

TR-1

W31Y1-3 RAMP

INPUT

SHOCK SPECTRA

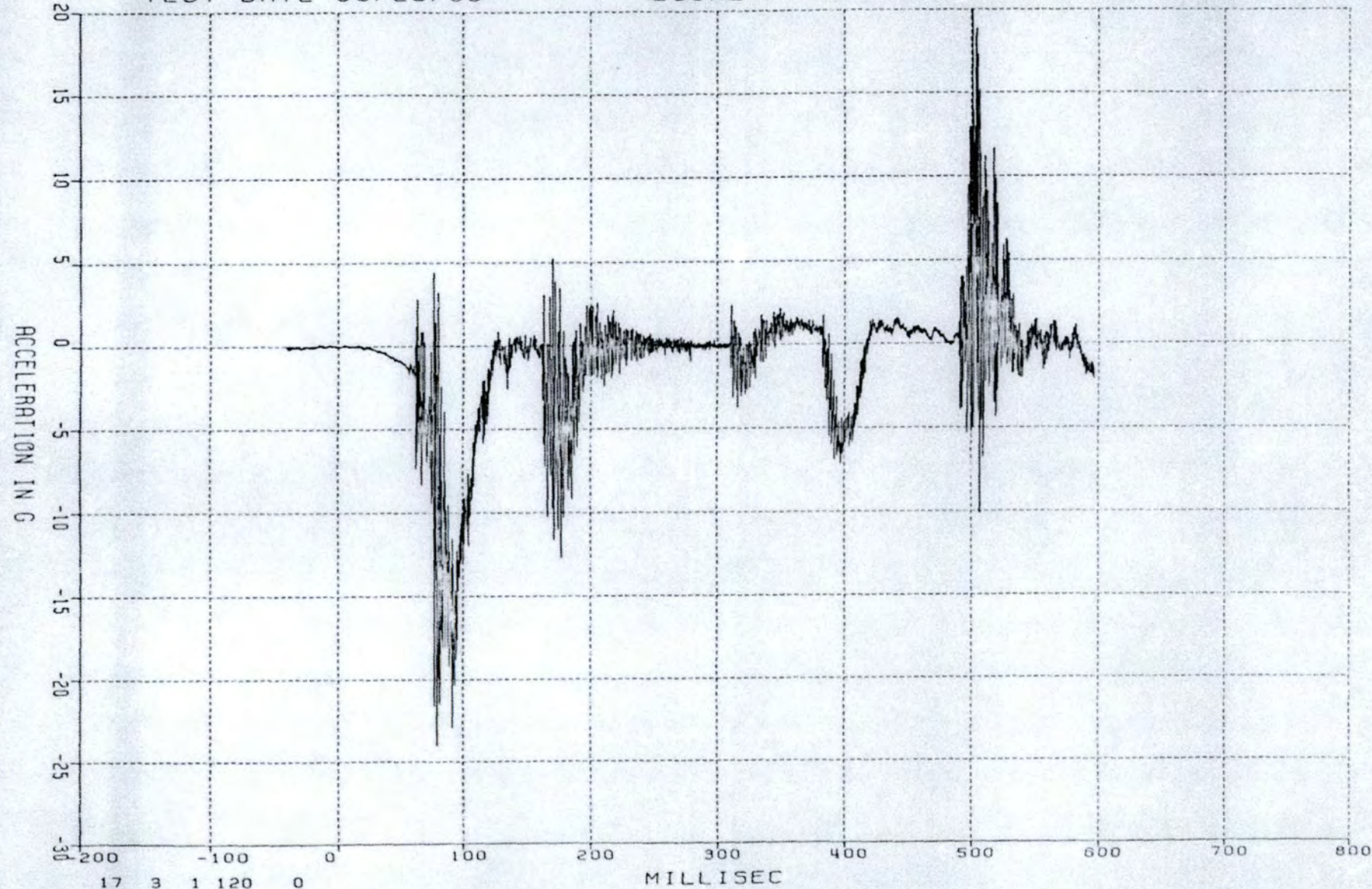
P/O= 10

000161

PLOT DATE
TEST DATE 06/20/85

HICAL 1.981
LOCAL -8.019

FILTER 2480.HZ
R#718109



000162

TEST# 0002

TR-3

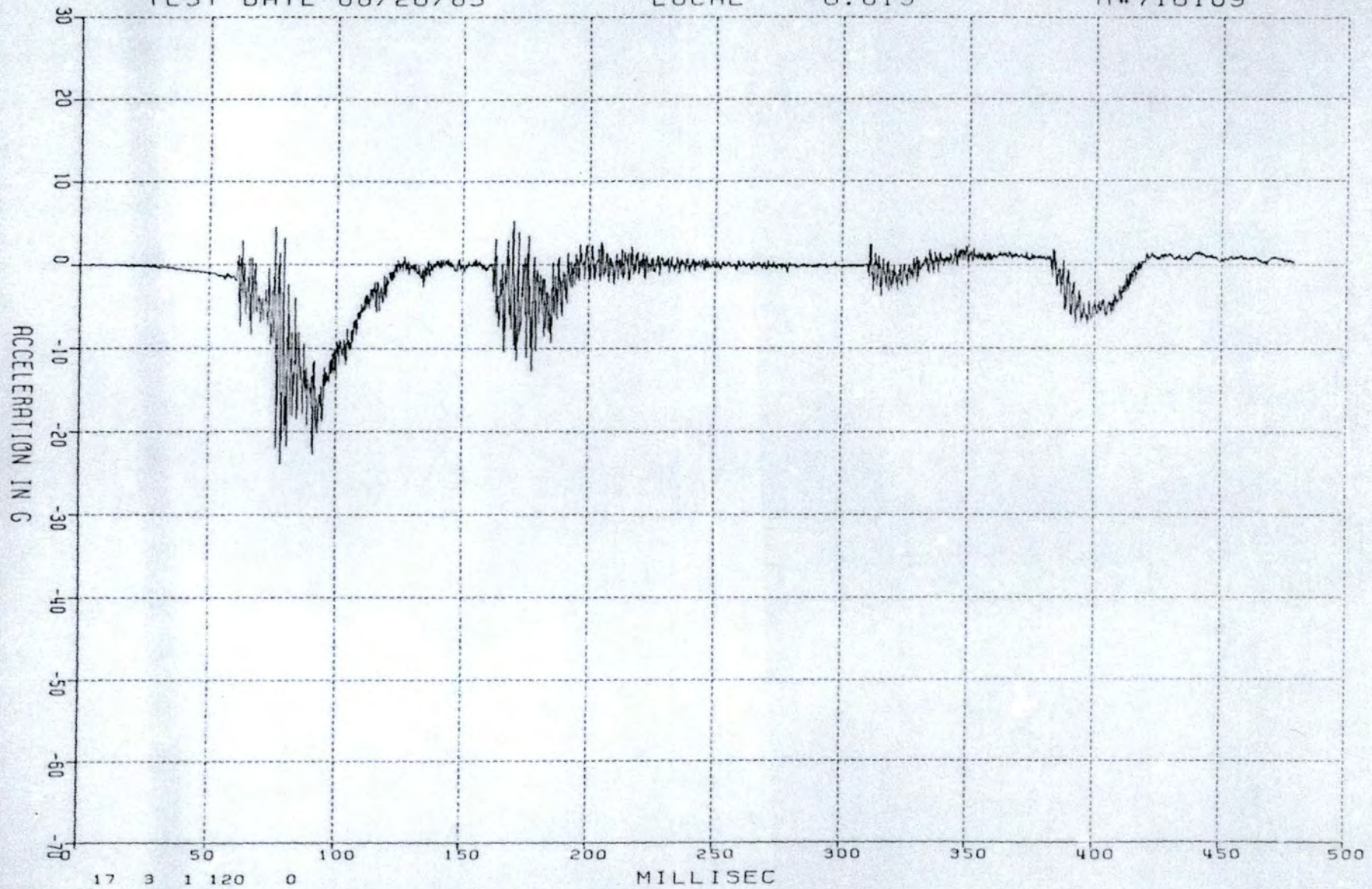
X-LONG

W31Y1-3 RAMP

PLOT DATE
TEST DATE 06/20/85

HICAL 1.981
LOCAL -8.019

FILTER 2480.HZ
R#718109



TEST# 0002

TR-3

X-LONG

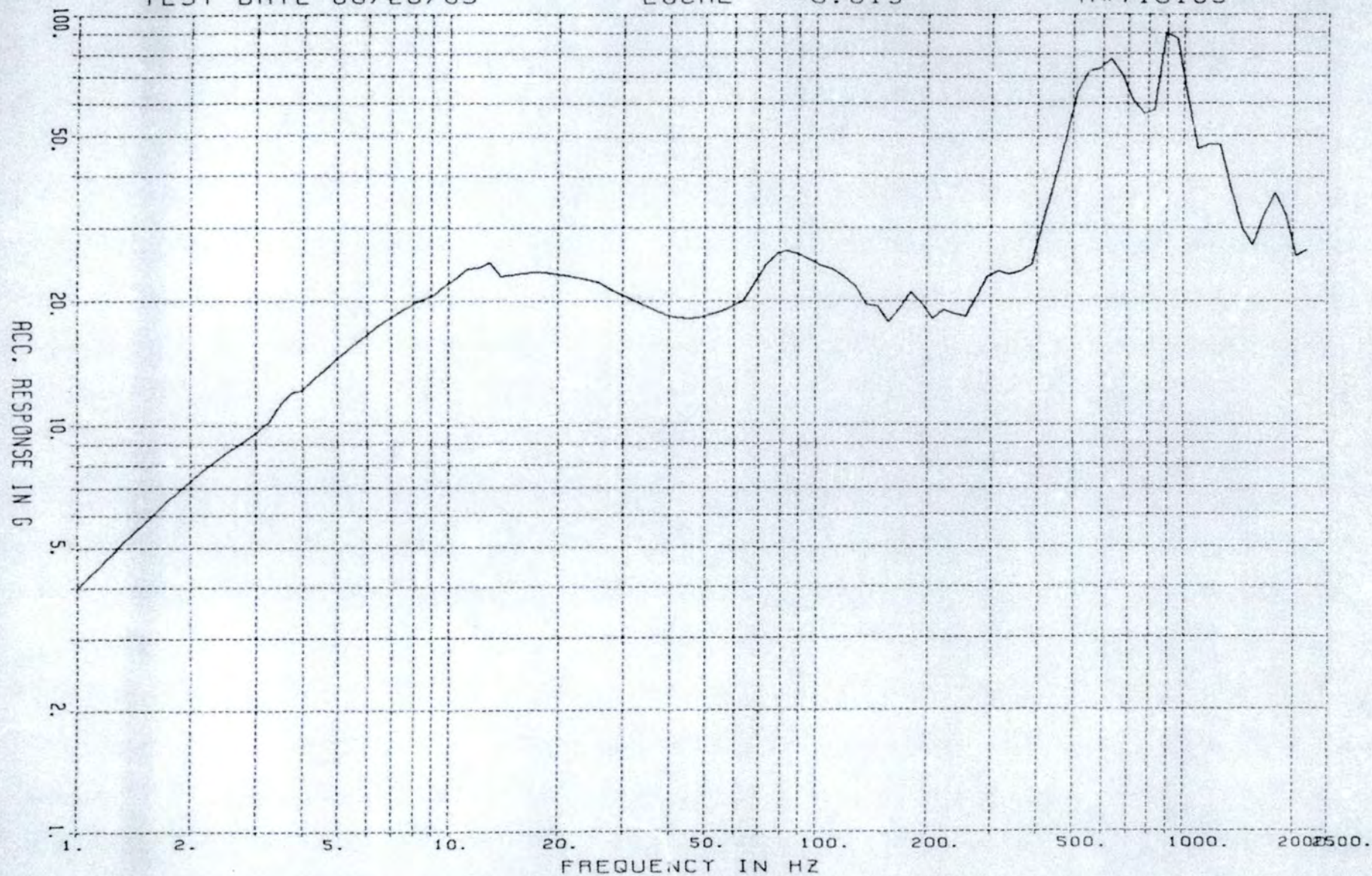
W31Y1-3 RAMP

000163

PLOT DATE
TEST DATE 06/20/85

HICAL 1.981
LOCAL -8.019

FILTER 2480.HZ
R#718109



000164

TEST# 0002

TR-3

X-LONG

SR= 4819.276

W31Y1-3 RAMP

SHOCK SPECTRA

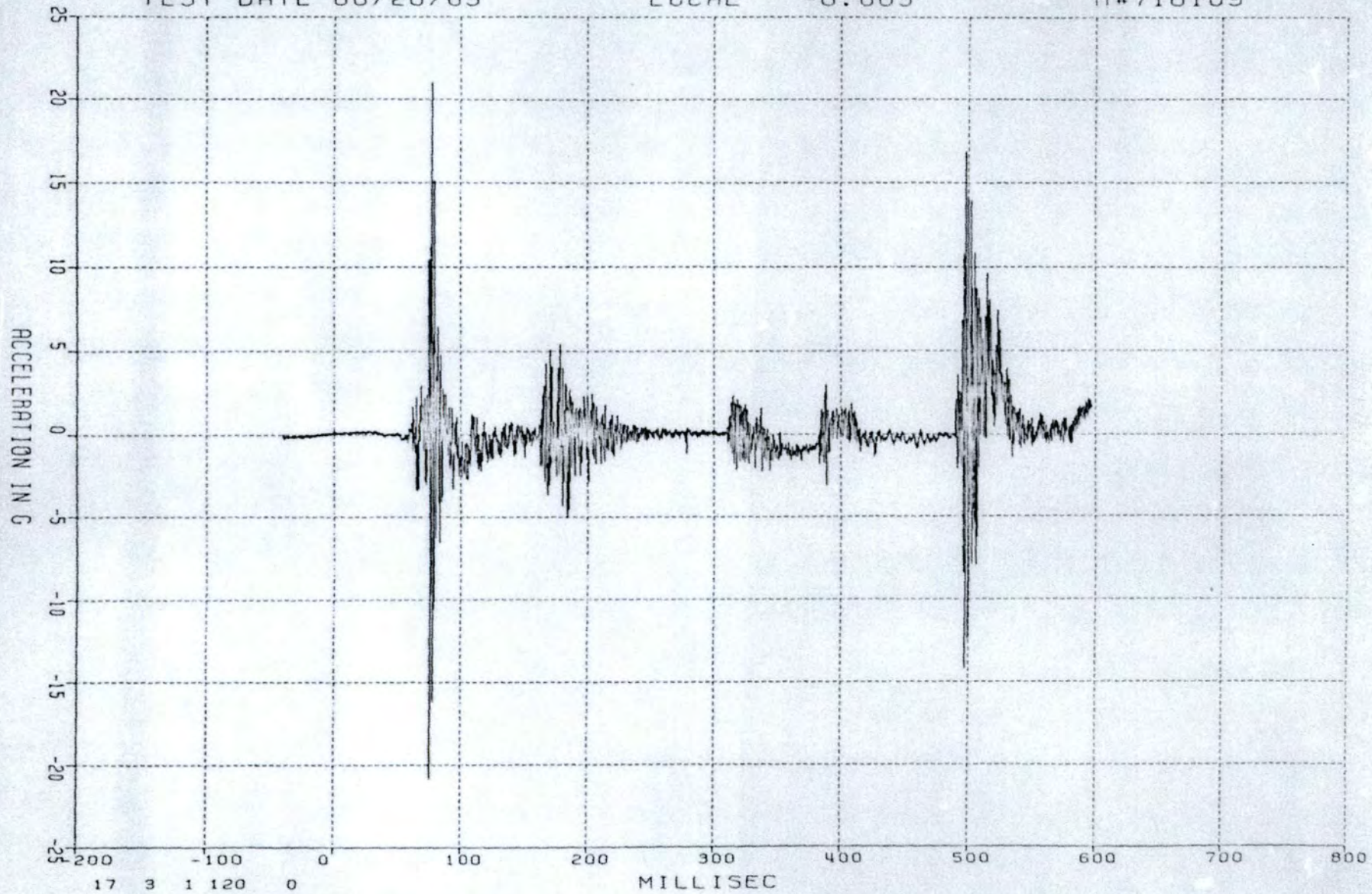
DR= .030

P/O= 10

PLOT DATE
TEST DATE 06/20/85

HICAL 3.195
LOCAL -6.805

FILTER 2480.HZ
R#718109



TEST# 0002

TR-4

Y-LAT

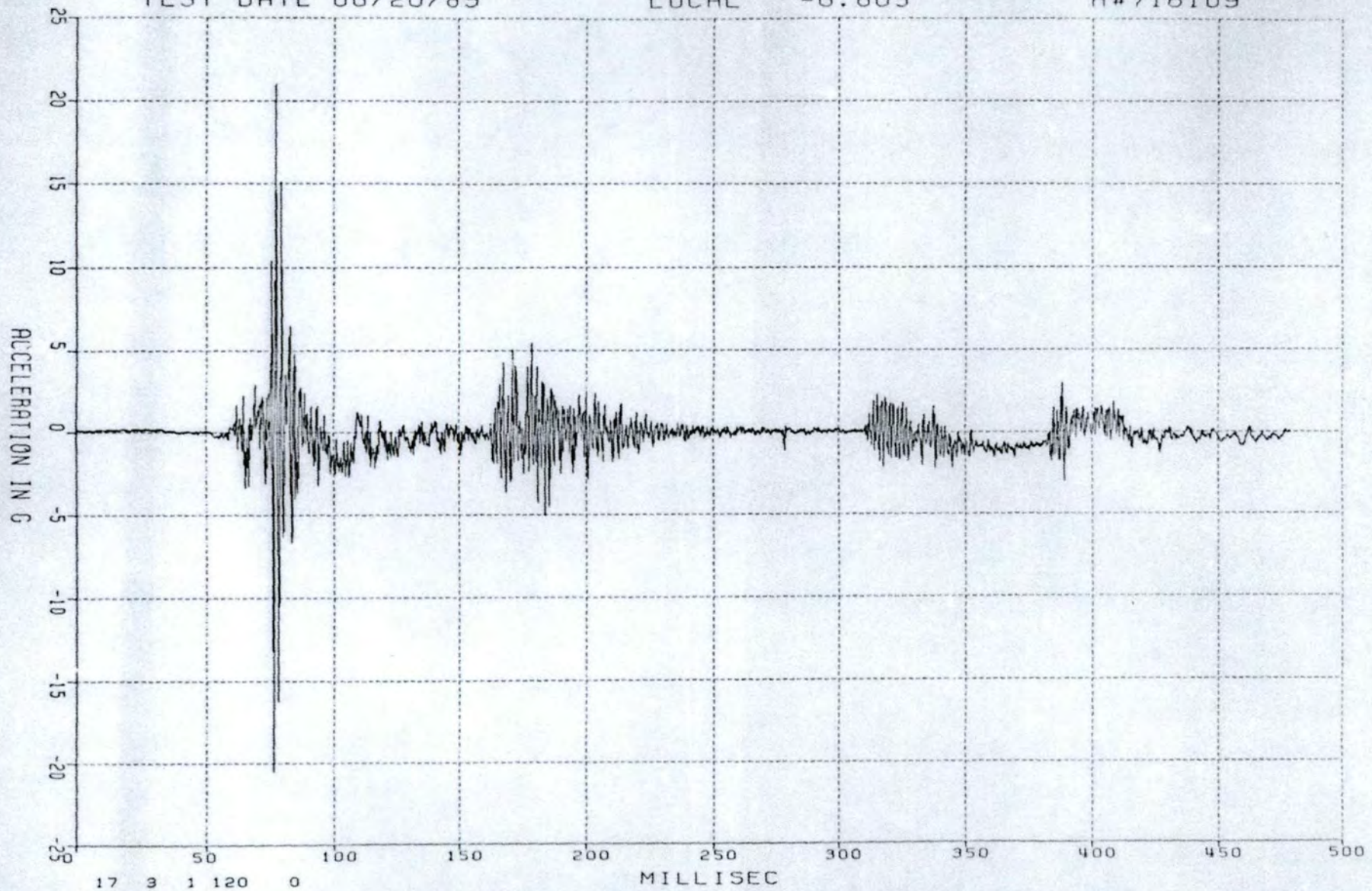
W31Y1-3 RAMP

000165

PLOT DATE
TEST DATE 06/20/85

HICAL 3.195
LOCAL -6.805

FILTER 2480.HZ
R#718109



TEST# 0002

TR-4

Y-LAT

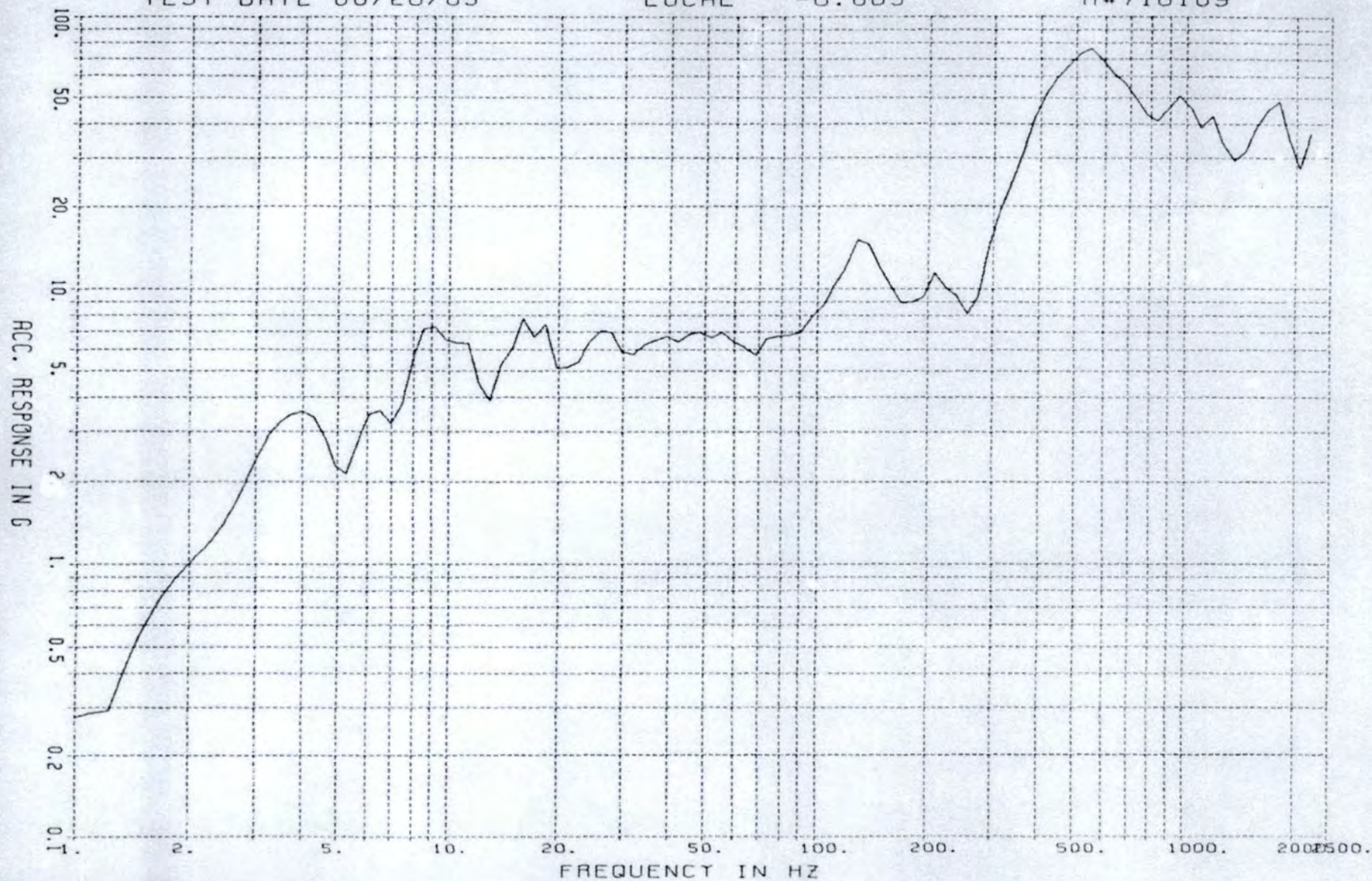
W31Y1-3 RAMP

000166

PLOT DATE
TEST DATE 06/20/85

HICAL 3.195
LOCAL -6.805

FILTER 2480.HZ
R#718109



TEST# 0002

SR= 4819.276

DR= .030

W31Y1-3 RAMP

TR-4

Y-LAT

SHOCK SPECTRA

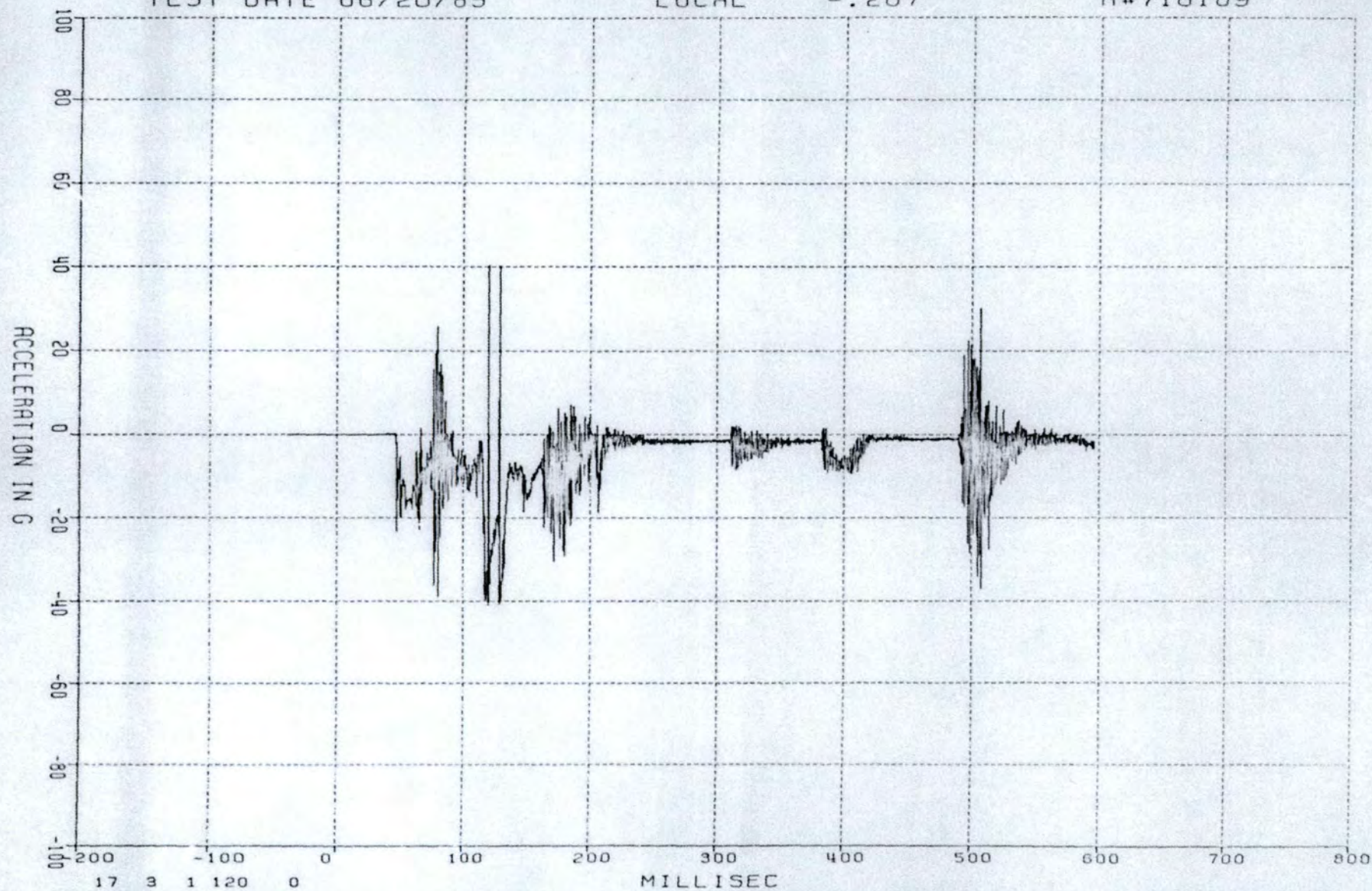
P/O= 10

000167

PLOT DATE
TEST DATE 06/20/85

HICAL 9.713
LOCAL -.287

FILTER 2480.HZ
R#718109



TEST# 0002

TR-5

Z-VERT

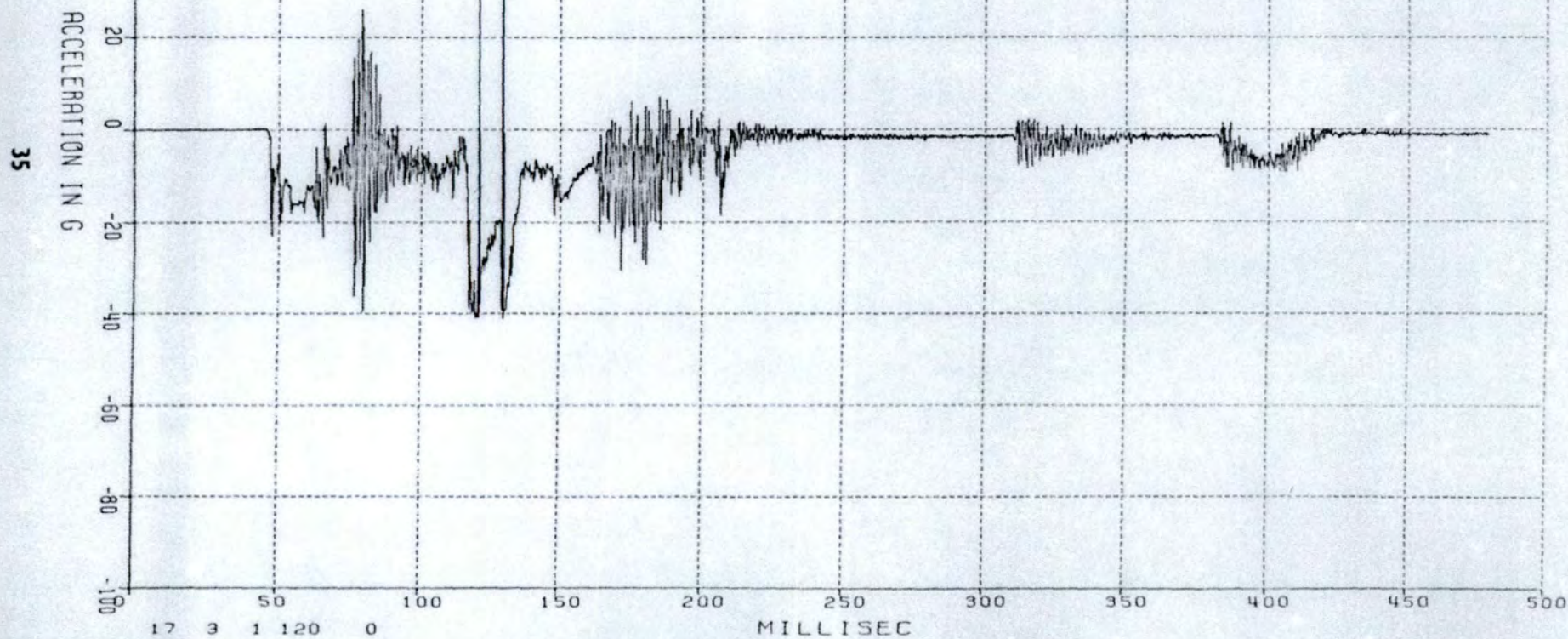
W31Y1-3 RAMP

000168

PLOT DATE
TEST DATE 06/20/85

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FILTER 2480.HZ
R#718109



TEST# 0002

TR-5

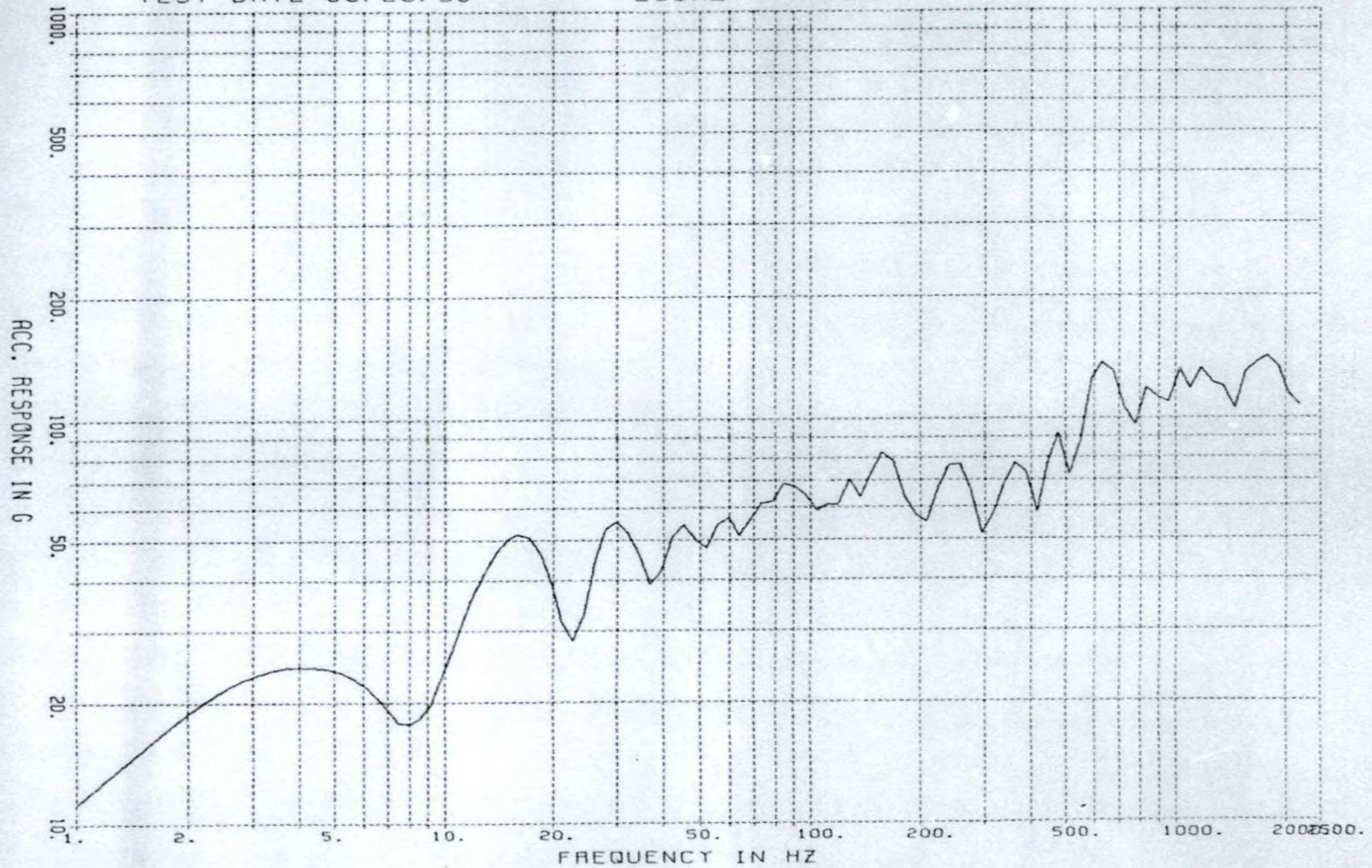
Z-VERT

W31Y1-3 RAMP

PLOT DATE
TEST DATE 06/20/85

HICAL 9.713
LOCAL -.287

FILTER 2480.HZ
R#718109



TEST# 0002

SR= 4819.276

DR= .030

W31Y1-3

RAMP

TR-5

Z-VERT

SHOCK SPECTRA

P/O= 10

000170